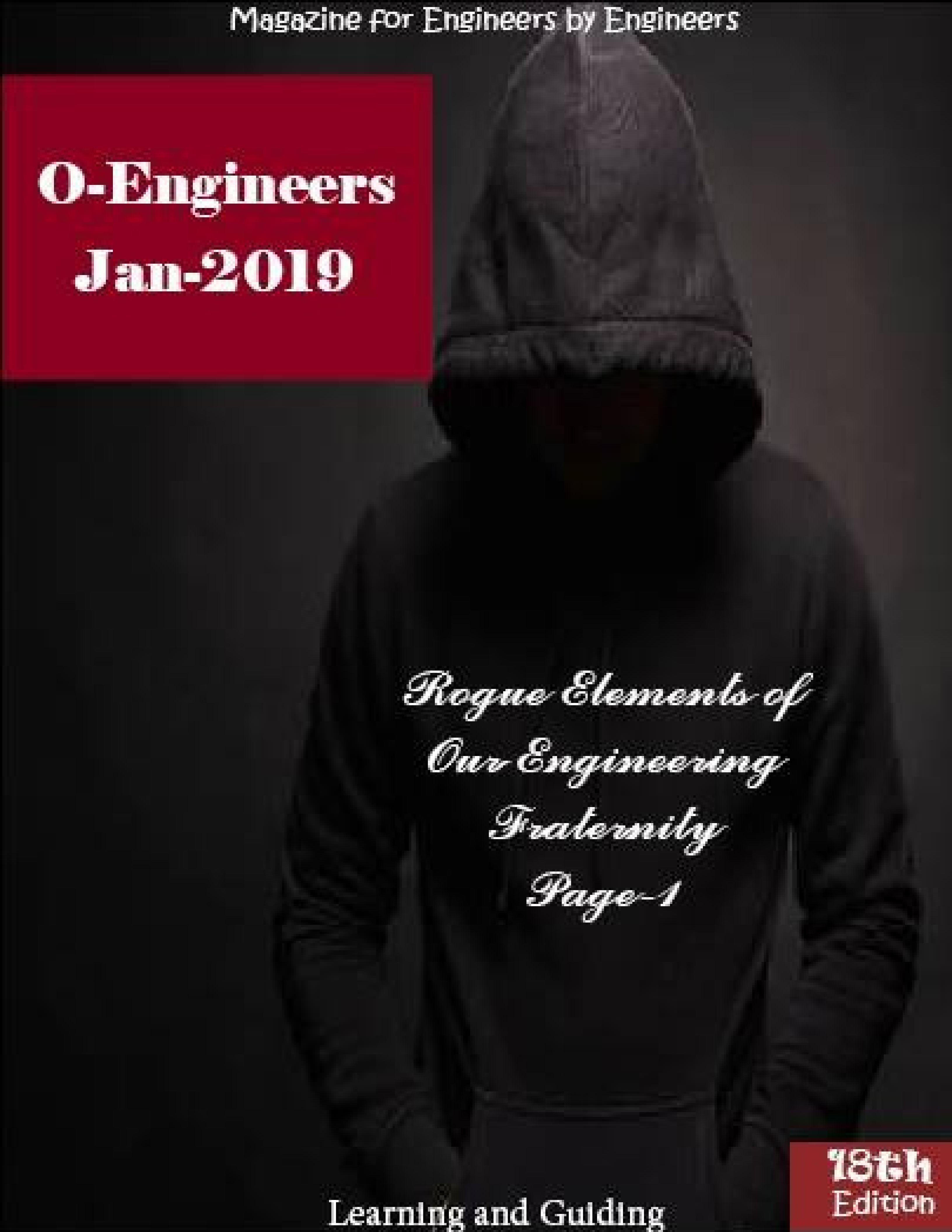
Magazine for Engineers by Engineers

O-Engineers
Jan-2019



Rogue Elements of Our Engineering Fraternity

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18th Edition

Learning and Guiding

Editorial Note

I discussed with my team and we are working on one global warming section or special issue, we hope that we will get it done in the next 2 months, on the other hand we are also discussing the management of agile education for more online certification courses for engineering students and professionals, on our list we gave priority to simulation courses, we hope that Agile and our magazine will present some helpful courses soon to our readers and subscribers, Me and my team is maintaining the policy of our mentors that to include all sort of feedback from our readers, sometimes it is very hard to publish negative feedbacks, we took these negative feedbacks as improvement points, we will keep moving forward and will enter new areas of learning in near future.

Engr. Taiba Azhar Shaikh

Feedback

*. Another great edition, i read Dec edition and felt it is good addition in engineering magazine.

Engr. Jameel Mohmmad

*. Ali's articles are good to read.

Engr. Nasir Mehmood

*. Most of the articles are just copy and paste, your authors are not working hard.

Engr. Imran shamim

*. i like atif's article.

Engr. Wajahat saeed

*. Why you stop publishing articles about frauds cases, please continue this series again, also i am observing absence of Arsalan's and irfan's articles, Rana irfan is the name in condition monitoring engineering, please bring him back.

Engr. Shaheen khan

Con

tent

Rogue Element in Our Engineering Fraternity





Engr. Sultan Hasan Ameen

I was amazed while my eyes caught the news that one Pakistani engineer arrested for running porn racket in private social media.
It all started when Canadian authorities informed Pakistani authorities about this heinous crime operated by Pakistani engineer. As per the Dawn newspaper reported on Jan 29th, 2018.

"On receipt of a complaint from National Child Exploitation Centre, Interpol in Ottawa, Canada regarding the involvement of a Pakistani in sharing child pornography online with people in the US, New Zealand, Australia and Canada, FIA Lahore on Sunday arrested Taimur Maqsood from Jhang. The suspect is an electrical engineer by profession," FIA cybercrime Deputy Director Khalid Anis told Dawn.
He said Interpol Canada had arrested a man involved in this heinous crime with links to Maqsood, who confessed to his crime.
"We have recovered mobile phones, a computer, modem, and laptops from his possession and a case has been registered against him under Section 22 of the new cybercrime law (Prevention of Electronic Crime Act)," Mr. Anis said, adding Maqsood would be presented before a magistrate on Monday (today) for physical

remand.
He said the FIA had launched an investigation to determine if more members were involved in this pornography ring. In FIA custody, Maqsood said he joined online child pornography groups and shared content with others. He claimed he had been doing this for two years as he had become addicted to it.
Last year in January, the FIA Lahore had arrested Saadat Amin from Sargodha for allegedly selling child pornographic content online.
Amin, whose case is pending in court, was accused of luring 25 children into the heinous act on the pretext of imparting them computer education. The FIA had discovered $30,000 Amin had received from a member of a child pornography network abroad as payment for the videos and images he had produced.(Dawn, 29th Jan 2018).
Same day another newspaper Pakistan today reported,

The Federal Investigation Agency (FIA) on Sunday nabbed an alleged member of a group involved in sharing online child pornography after acting on a tip-off received from the Canadian Interpol office.
FIA Cybercrimes Division Deputy Director Khalid Anis said that around 60 gigabytes of pornographic data

were extracted from the laptop and computer owned by the accused, identified as Taimur Maqsood. He also informed that the nabbed accused was an electrical engineer by profession.

"The suspect belongs to an international ring that shares porn videos among themselves," Anis said, adding that the police was currently trying to find the exact number of members involved in this criminal activity. He also said that the groups worked as a syndicate and comprised of members from Pakistan, Canada, New Zealand and Sweden."

An official from FIA said that the suspect was arrested after being traced through his PTCL number and his IP address, adding that the accused, who had joined the group two years ago, was arrested from Jhang's Satellite Town area.

During interrogation, the accused told the police that he watched the videos for mental gratification, adding, "After joining one group on KIK messenger, I found links to many other groups that also shared child pornography along with other videos."

The individual was identified by the Canadian authorities after conducting an operation in Ottawa. They also passed on the information to FIA.

As a result of the growing incidents of child molestation

in Pakistan, the FIA had formed a two-member committee from its cybercrimes department to effectively tackle this issue. A notification in this connection had also been issued and all zonal heads have been directed to compile reports of all reported cases regarding child abuse and pornography in the country.

Anti-child pornography laws in Pakistan

Punishments for child pornography was introduced in Pakistan's law after the Kasur child sexual abuse case of 2015 surfaced to the disbelief of the entire country. Another bill in this connection was also tabled by the National Assembly Standing Committee on Interior in October 2017 which extended the prison sentence of offenders from 14 to 20 years.(Pakistan Today, 29th Jan 2018)

I, myself is an Electrical Engineer, when I analyzed this case, I found myself shamed due to belonging of this culprit from our society, but he is only representing 0.0000001% criminal mind of our society, I also found that due to materialistic conversion of our education system will produce more taimors in near future, absence of enough ethical or religious fragments in our curriculum is developing the ethically dead minds.

Our educational system is colliding with open society mantra, Karl Popper's open society concept is misunderstood by some elements of society, they are using this concept and providing the easy path to overload the animal instincts of a human. this overloading will be leading to the transformation of common human into a beast. I read an article of Engr. Arsalan hamid regarding comparison of education curriculum of engineering universities, I am in opposition to Arsalan's viewpoint that courses like Islamiat and social studies must not be included in engineering studies, this concept is totally flawed, we need to introduce more ethical and religious fragments in our scientific studies, because every religion in the world is informing this to their believers to be good citizen and follow general ethics, but on the other side Practicing science is purely unethical in core of daily livings. I am saying practicing science because science, in theory, is totally aligned with religion and norms of society. I thought some solution, but before moving forward I also want to add one point that I do not hate Darwinian concepts, but I think that these concepts are not totally true but under continuous criticism, but unfortunately our engineering education system treating students as a separate object from our society.

now for solutions, I propose to reduce the rogue elements like Taimor from our societies.

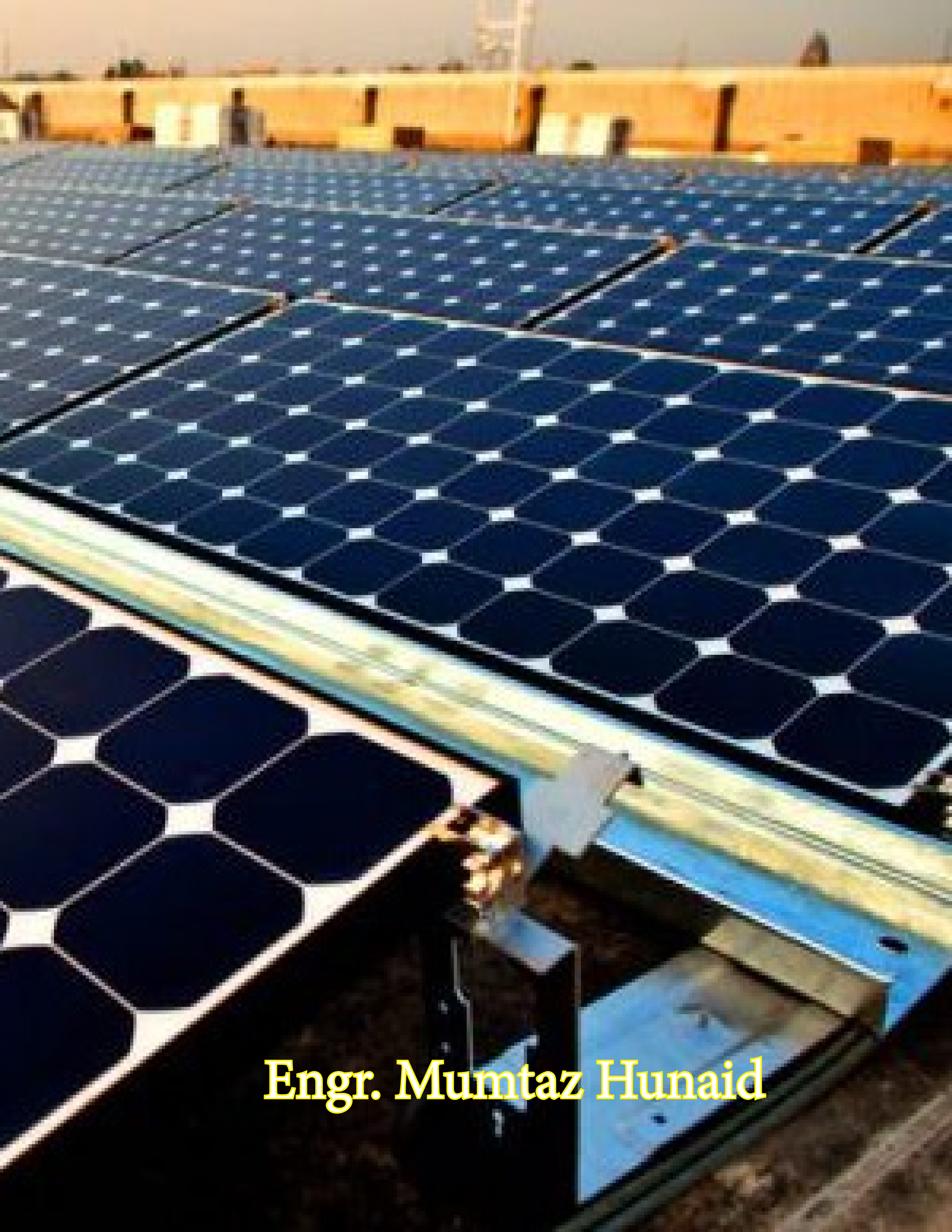
*. Establish study circle groups in engineering universities, where the lecturers will lead these study group, the aim of the study group is to promote the culture of dialogue regarding the different theoretical point of views and current social norms

*. Increase Cyberporn prohibition, Porn is one of the bed germs which came with brilliant information technology from the west.

*. University administration arranges different seminars in which self-help, religious and management gurus will be invited to promote the aimful life concept in students.

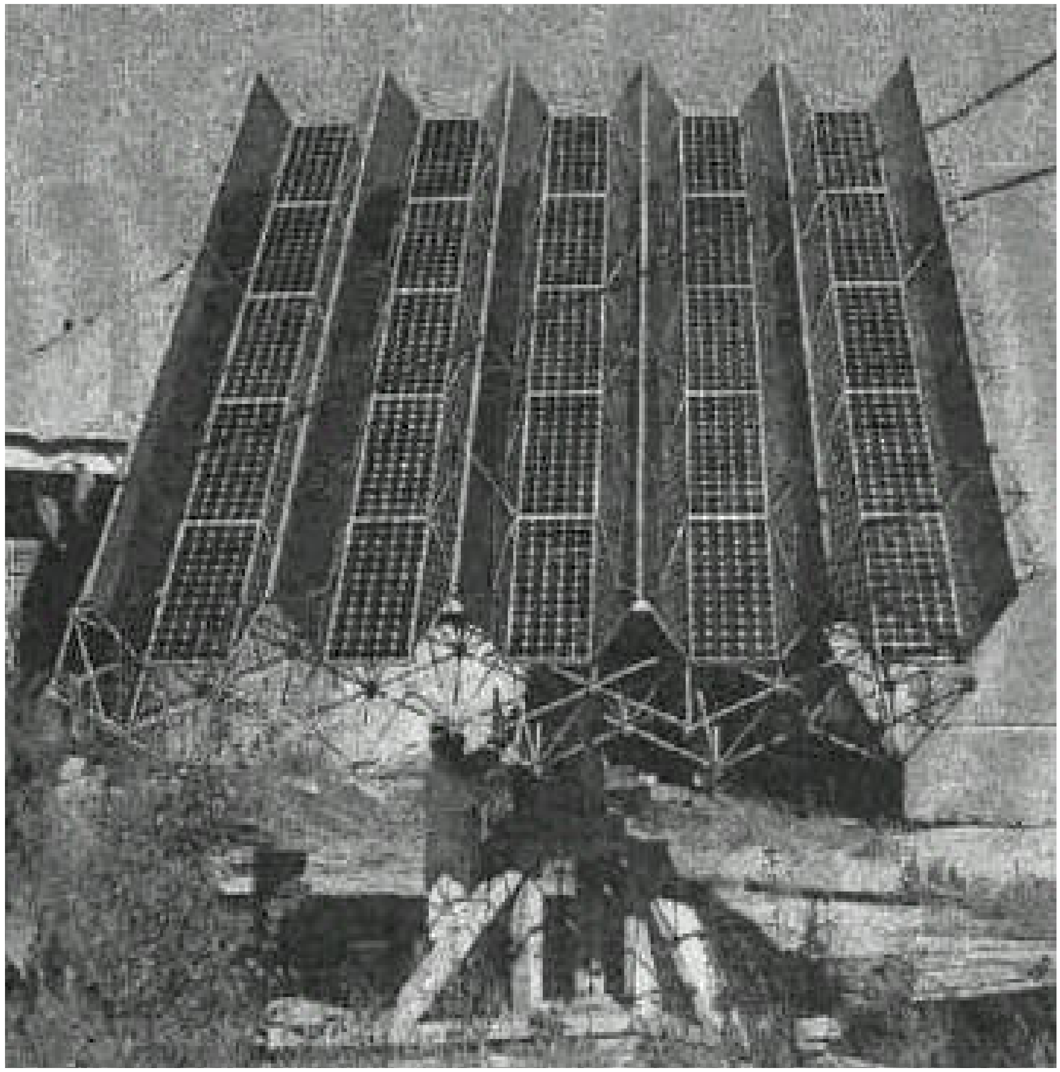
these are some of my suggestions, i am not saying to prohibit any freedom of the citizen, but it must be free from rogue elements, else we will have more taimors in our society, which in result will destroy the cultural and ethical image of our nation. We need to protect our children, Our future. ■


Solar
installation


Engr. Mumtaz Hunaid

The autonomous solar installation shown in Figure mention below is intended for electrical supply of an individual consumer.

Helioelectric installation GEU-1,5



The advantages of the installation are based on the use of photovoltaic modules in combination with flat mirror concentrators, which increase the efficiency of conversion of solar energy into electrical energy by 1.5 - 2 times and a tracking system that provides automatic tracking of the Sun from its rise to sunset and thereby increased " the collection of "incident solar energy.

Helioelectric unit GEU-1,5 has the following technical parameters:

o peak output electrical power of the installation - 1.5 kW;
*.Surface area receiving solar radiation - 25 square meter;
*.The number of photovoltaic modules designed for the generation of DC electric power with a peak power of 40 W with insolation of 1 kW / m2 - 25 pcs .;
*. Coefficient of concentration -1,5-2;
*. Tracking of the position of the Sun - automatic, with an accuracy not worse than -2 °;
*. The generation of electrical energy during the day with the installation of a GEM-1.5 is three times higher compared to a similar one that contains fixedly installed, for example, on the roof of a building, photovoltaic modules used in the installation.

An autonomous solar photovoltaic plant (code SFEU-1), shown in Figure A, provides a combined generation of electrical and thermal energy and is intended for use as a module of a solar power station of a block-modular design

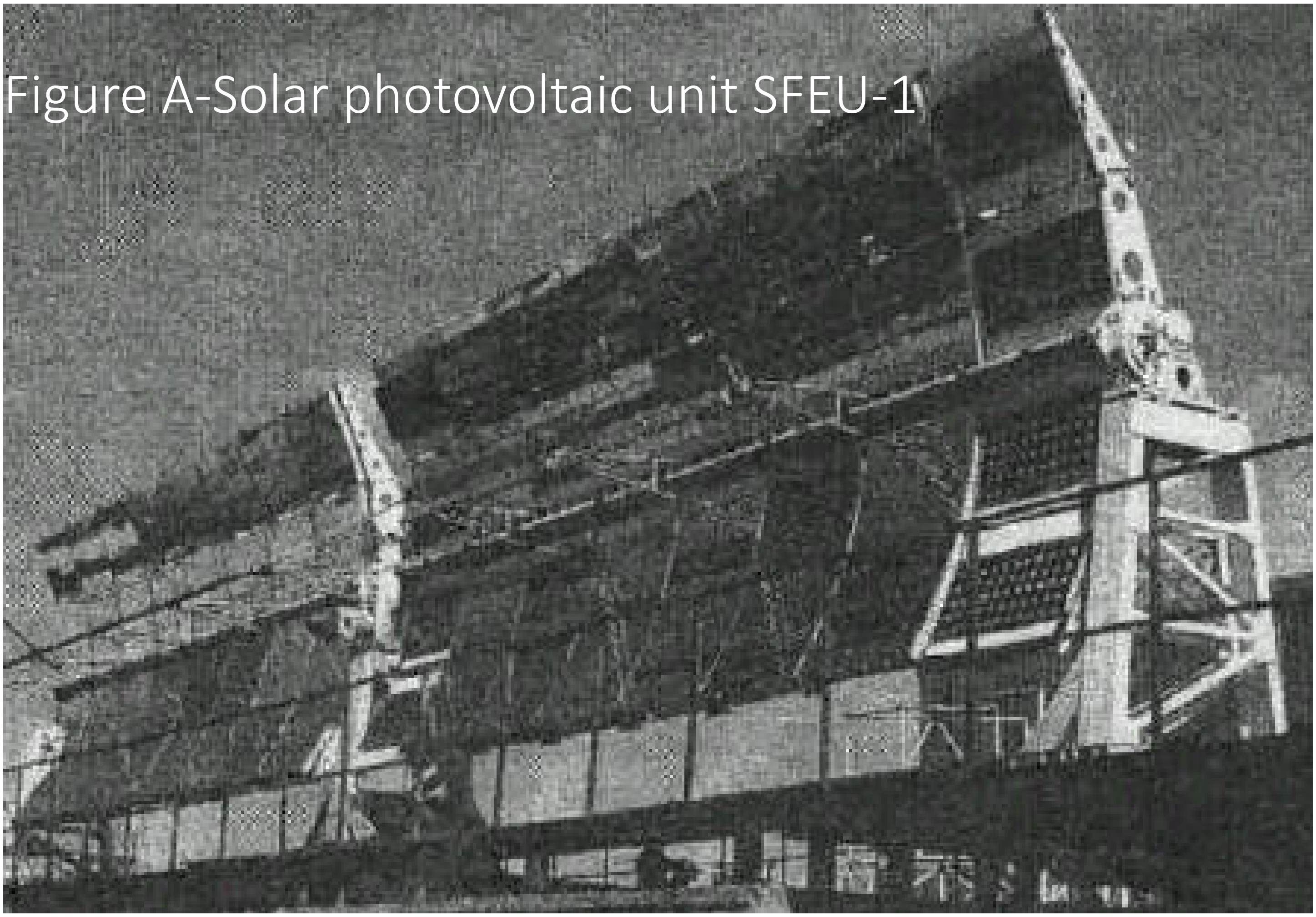


Figure A-Solar photovoltaic unit SFEU-1

The installation equipment is installed on a single-axis turntable with an automatic tracking system for the movement of the Sun, on its two arms there are two systems concentrating solar radiation. One of them (in fig. Right part) is made of a set of flat mirrors, the area and surface shape of which corresponds to the shape of the surface of a photothermal receiver-transducer composed of a set of monocrystalline silicon elements connected in series and forming a photocell elongated along the concentrator axis. A hub by adjusting its component mirrors provides a uniform illumination of

all elements of the photothermal receiver and increases its illumination 13 times.
The heat released during operation from the radiator outlet of the photothermal receiver in the form of heated water is supplied to a water-heating element made in the form of a pipe installed at the focus of the concentrator located on the other arm of the turntable.
Solar installation SFEU-1 has the following technical parameters:

*. Peak output electric power - 0.8 KW and heat - 10 KW with insolation 1000 W / m;
*. The area of the solar system-receiving concentrating system of the photovoltaic part - 24 m2 and 32 m2 - of the water-heating part;
*. The maximum concentration coefficient of the photovoltaic part: 12 with uneven illumination in the plane of the photodetector is not worse - 10%, and 30 - of the water heating part;
*. The cooled photothermal receiver of tubular type, provides the conversion factor of solar energy into electrical energy not worse than 10% and into thermal energy not worse than 70%.

The automated tracking system for the Sun is powered

by photovoltaic modules such as MS-40, which ensures the autonomy of the installation (without human intervention).

Autonomous solar ultraviolet installation (code UV-05), shown in Figure B, is intended for conducting accelerated testing of materials, paints, coatings; for the destruction of chemical pollution, in particular, for the disinfection of drinking water. The concentrator of the installation, consisting of 150 flat hexagonal fillets with the circumference of 420 mm, is mounted on a turntable. Paraboloid farm installation has a diameter of about 5 m with a radius of curvature at the apex of 6 m.

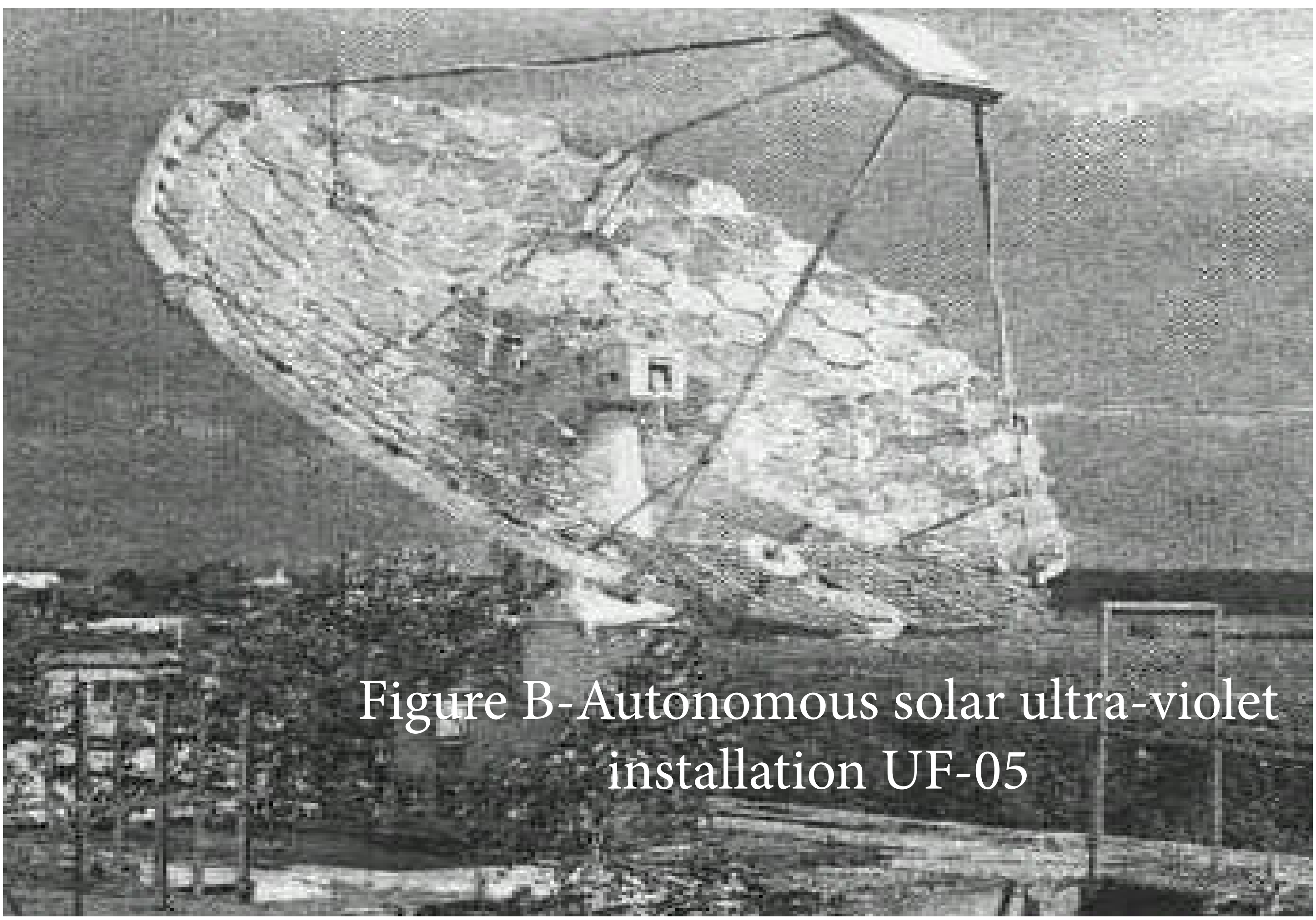


Figure B-Autonomous solar ultra-violet installation UF-05

To concentrate the UV portion of the solar spectrum required for irradiating a sample, flat facets are made of glass with a multilayer interference coating reflecting solar radiation in a given UV wavelength range and transmitting radiation to the rest of the solar spectrum. The receiver-reactor of the installation is a massive metal frame of rectangular cross section, with two opposite sides of which are mounted tubular boards for accommodating 16 quartz glass tubes arranged in two rows, through which the liquid processed by the UV radiation is passed. It should be noted that the installation is completely autonomous and does not require an external source of electricity - four photovoltaic modules with a peak power of 40 W placed on the hub, each fully ensure the operation of an automated tracking system for the Sun from its rise to sunset with an accuracy of no worse than 2 °.
Plant capacity for water treatment up to 1,5m3 / h. The efficiency of water purification from harmful biological components in a single pass with an insolation of 500 W / m is 70%.
As is well known, the combined effect of the atmosphere and solar radiation over a long period of time can cause irreversible changes (degradation or natural aging) of a wide range of materials and

products, for example, changes in the color of construction and finishing materials, paint coatings and textile dyes, known as "burnout "or" fading ". Therefore, the use of UV-05. As an installation for carrying out accelerated testing of various materials for exposure to ultraviolet radiation, it can shorten the time taken to test materials for aging from several years to several weeks.
The solar power plant (cipher - GEU-5) presented in Figure C, is designed to test the technology for producing highly concentrated solar radiation in the spot, commensurate with the diameter of the cavity receivers of real heat engines, for example, Stirling electrical units, gas turbine generators.

A hub of a solar power plant, which is a composite mirror with a diameter of about 5 meters, made up of 180 elementary aluminum mirrors (facets) of hexagonal shape with a circumference of 420 mm. The facet is a spherical mirror with its radius of curvature, determined by its location on the hub. A total of 7 types of bezel are used in the concentrator, respectively located on concentric circles equidistant from its center. The solar power plant GEU-5 has the following technical parameters:

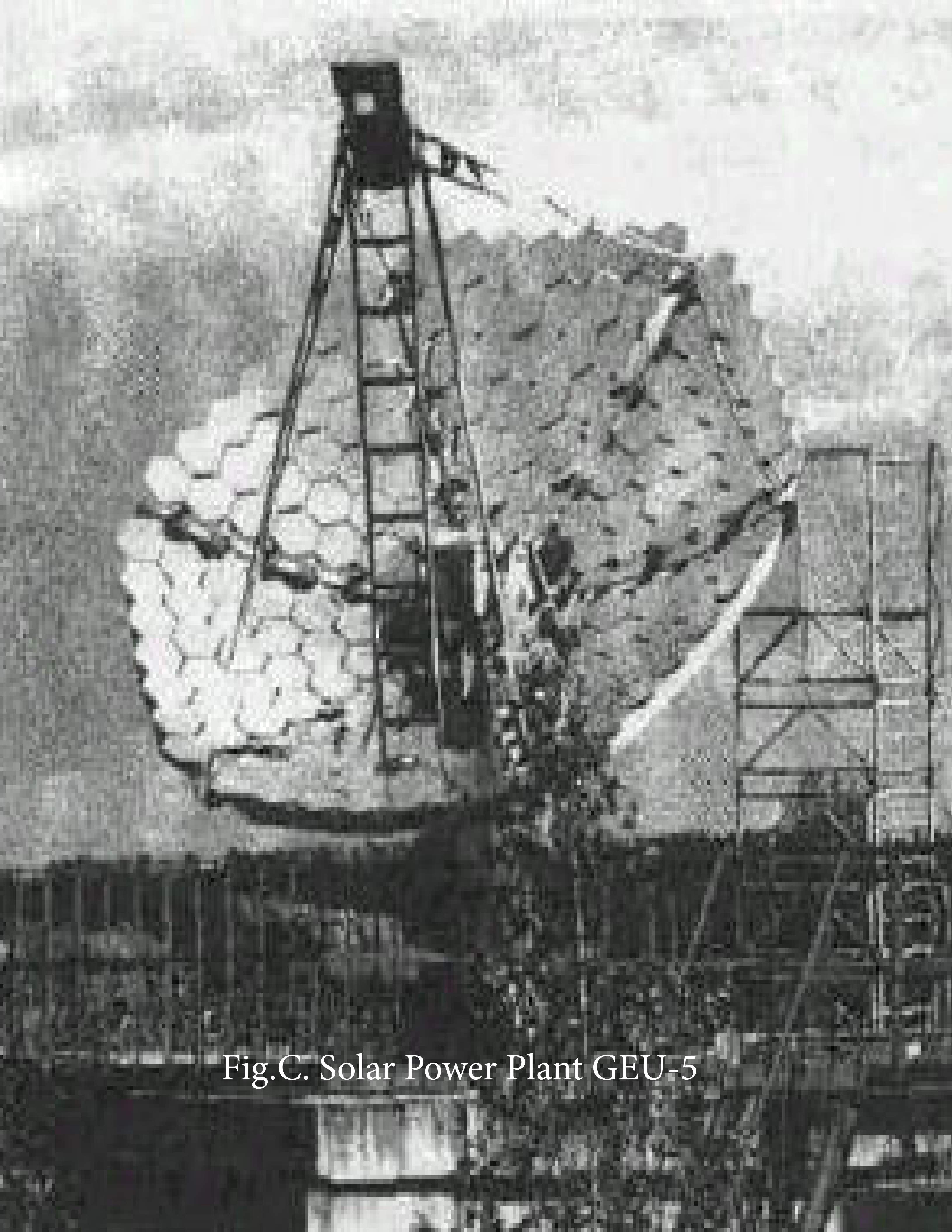


Fig.C. Solar Power Plant GEU-5

o Diameter of the composite facet concentrator -5 m;

o Aluminum facets of spherical shape of the surface in the amount of 180 pcs., laid on forming a paraboloid in 7 rows;

o The shape and size of the facets is hexagonal, the diameter of the circumscribed circle is 420 mm;

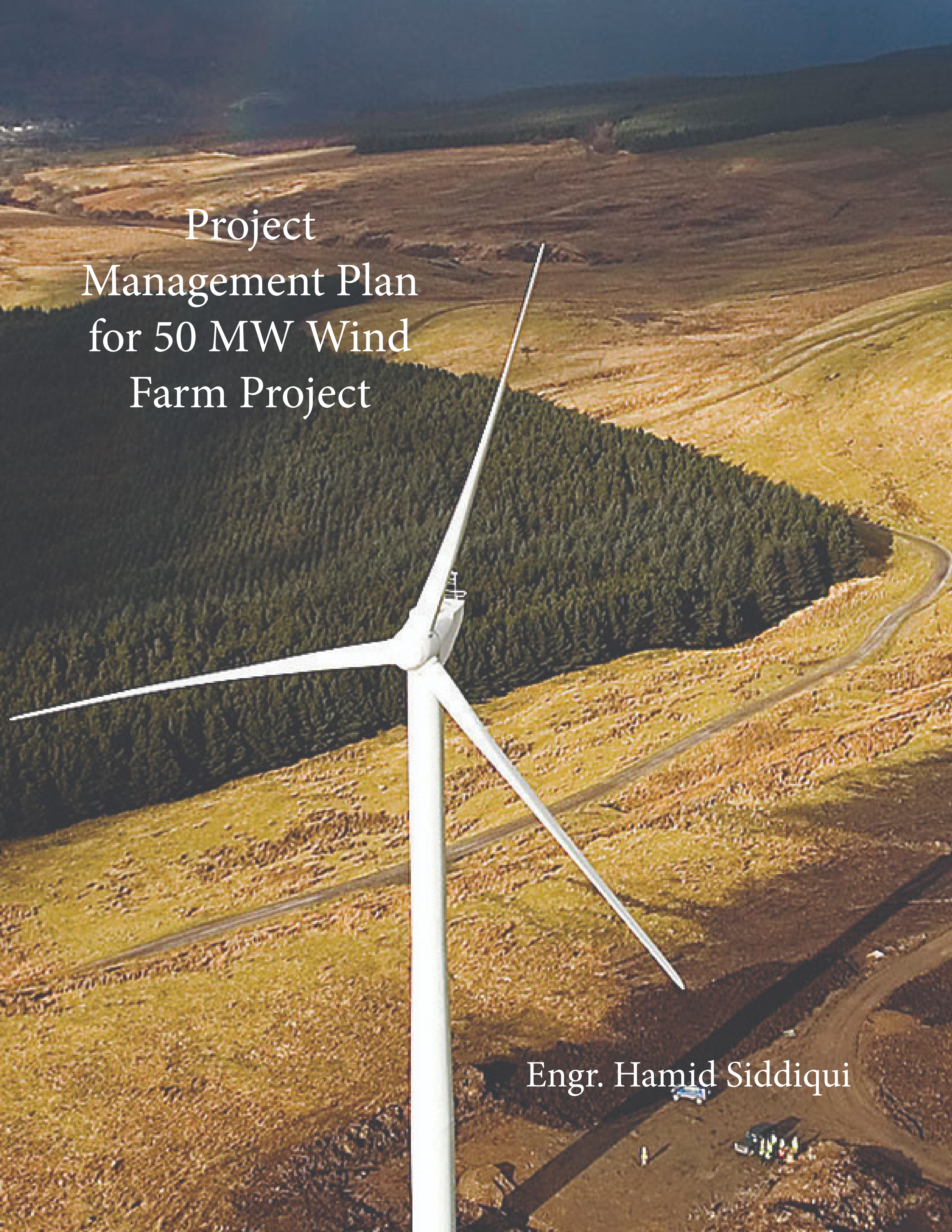
o Processing technology of the reflecting surface facet - diamond turning;

o The reflection coefficient in the range of the solar spectrum is not less than 85%;

o The calculated concentration factor is 3100, which ensures the size of the focused beam is 90 mm;

o The calculated value of thermal energy at the focus of the concentrator - 12.3 kW at an insolation level of 1000 W / m;

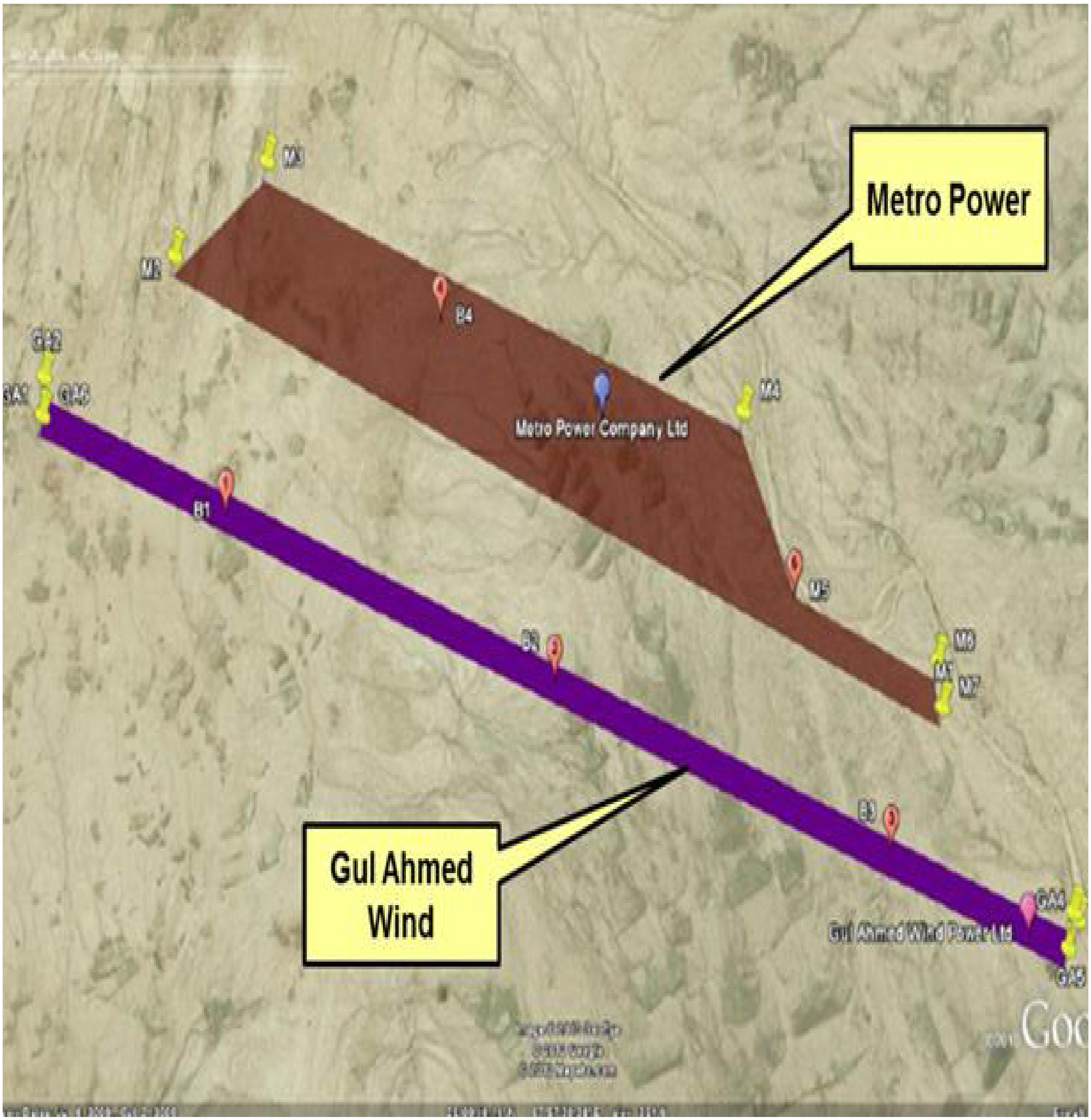
o The temperature reached in the cavity receiver is 550 ° C. ■



Project Management Plan for 50 MW Wind Farm Project

Engr. Hamid Siddiqui

The project site is located in the south of Pakistan between Karachi and Hyderabad,
approximately 100 km inland from the coast in a semi dessert area located close to the city Jhimpir. The site is adjacent to national highway.



Project started development in 2008 after Company was issued a Letter of Intent and acquired 1553 acres of site land from Alternative Energy Development Board of Pakistan (AEDB). The AEDB is responsible for administering the renewable energy policy of Pakistan. Now the project is in advance stage of development and the Company has carried out detailed technical and financial feasibility studies and obtained most of the key permits.

Approximately 4.5 years of wind data have been collected using five 80 meters meteorological masts. Garrad Hassan did the wind analysis and Sgurr Energy did the feasibility study for the project. Based on the data collected and analysis, the predicted long-term mean wind speed averaged over all turbine locations at a hub height of 80 m is 7.7 meters per second with net capacity factor of about 32% to 33% (about 155GWh per annum). Initial Environmental Examination was carried out by a local consultant and reviewed by Sgurr Energy during the feasibility study stage. Based on the studies the environmental approvals have been obtained from the government. Other studies key studies like geotechnical studies, topographic surveys, and logistic study are also completed. The Company have also obtained the tariff order and generation license from

NEPRA, the electricity regulator of Pakistan. Letter of Support from AEDB, a key approval need for signing the off take and implementation agreements and for financing of the projects was issued by AEDB to the Company. Company entered into a 20 year standardised Energy Purchase Agreements ("EPAs") with the National Transmission and Despatch Company Limited ("NTDCL")—a distribution company—through the Central Power Purchasing Authority ("CPPA"). The Government guaranteed NTDC's payment obligations under the EPAs as part of its obligations under the standardized Implementation Agreement ("IAs"). The IA will also include other Government commitments to the Project that are standard for IPPs in Pakistan. Company has obtained in-principle commitments from project lenders for significant portion of the debt.

The Project has a strong economic justification. Key economic benefits include:

(i) displacing expensive fuel oil and diesel power plants (estimated all-in cost currently equating to about US cents 20 to 25 per kWh versus wind tariff of US cents 14~15 per kWh, (ii) reducing increasing dependency on imported petroleum fuels, (iii) reducing the need for power sector subsidies, and (iv) helping reduce Government's liabilities to the power sector. The strong

wind potential in Pakistan means that the Project is viable without direct subsidies, with tariff significantly below avoided cost.

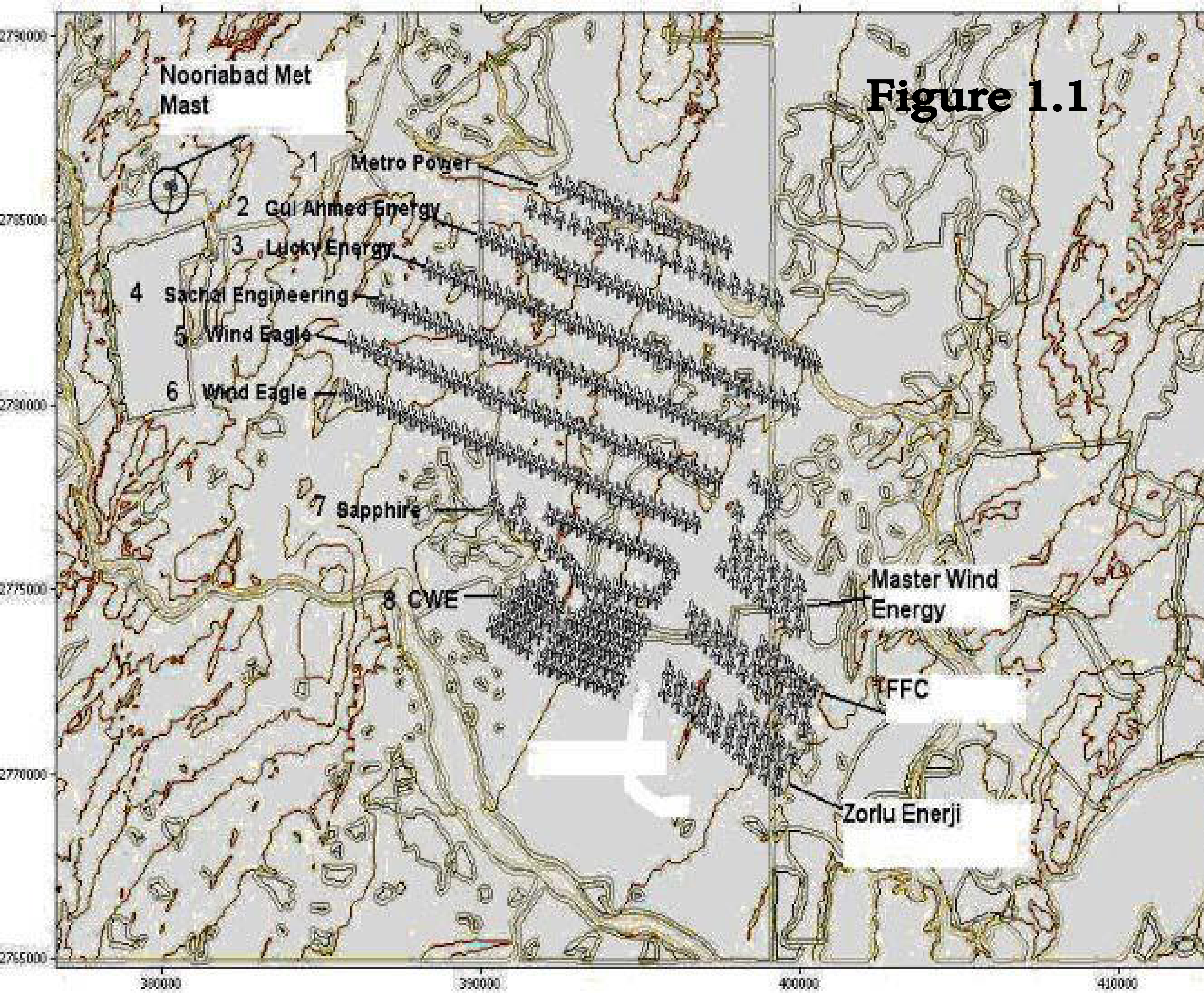
In Pakistan power generation is dominated by thermal power plants wherein furnace oil and gas are being used as a fuel. The price of furnace oil is dependent on international price of crude oil. The price of crude oil in the international market is increasing day by day, thereby increasing the cost of power generation proportionately. Gas being an indigenous fuel, is comparatively cheap but domestic production of gas is on decline and not available for power generation in required quantity. Therefore, the government has to rely on power generation, mostly on furnace oil, resulting in more costly power generation.

The steep high electricity bills have made it difficult for middle income and low income consumers to afford.

Pakistan is located on such a geographical location that abundant quantum of renewable energy potential including wind energy is available.

Pakistan adopted a policy of the use of renewable energy in 2006 and revised it in 2011. This policy encourages the private sector to implement renewable energy projects, including wind power generation, by providing various regulatory, fiscal and financial incentives.

The AEDB has issued a number of LOIs to private sector investors for development of wind power projects of 50 MW each that includes the Metro Power Company Limited (MPCL). A map showing locations of power plants for which LOIs has been issued in Jhimpir area is presented at Figure 1-1 whereas wind power potential in Pakistan is presented at Figure 1-2. The development of wind power plants will not only be helpful in meeting power shortage in the country but will also be environmental friendly as it will not produce any SOX and NOX in the atmosphere. In addition, it will provide electrical energy to national grid at almost same tariff for whole concession period whereas the tariff of power produced by thermal resources is increasing day by day. Metro Power Company Limited have taken the advantage of incentives offered in the Policy, obtained a Letter of Intent for development of 50 MW wind energy farm (WEF) around 13 km almost north of Jhimpir and at a distance of more than 15 km from Keenjhar lake wildlife sanctuary. Objective of the company is to undertake the power generation and meet the power shortage in the country. In this regard, the company has so far acquired 1553 acres of land at Jhimpir, District Thatta, Sindh, Pakistan, authorized by Alternative Energy Development Board (AEDB) to set



Nooriabad Met Mast
1 Metro Power
2 Gul Ahmed Energy
3 Lucky Energy
4 Sachal Engineering
5 Wind Eagle
6 Wind Eagle
7 Sapphire
8 CWE
Master Wind Energy
FFC
Zorlu Enerji

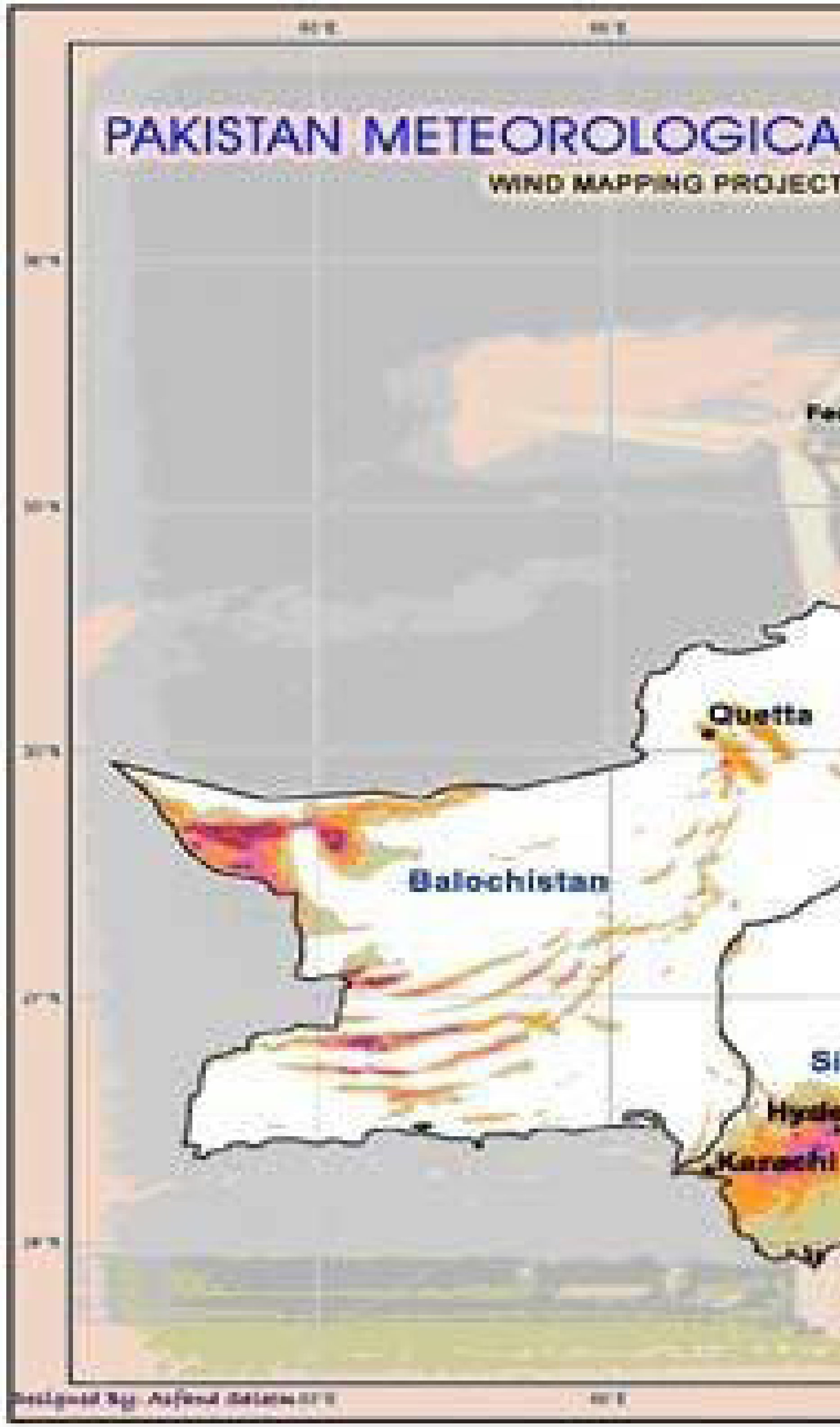
Figure 1.1

up a 50 MW Wind Power Project.

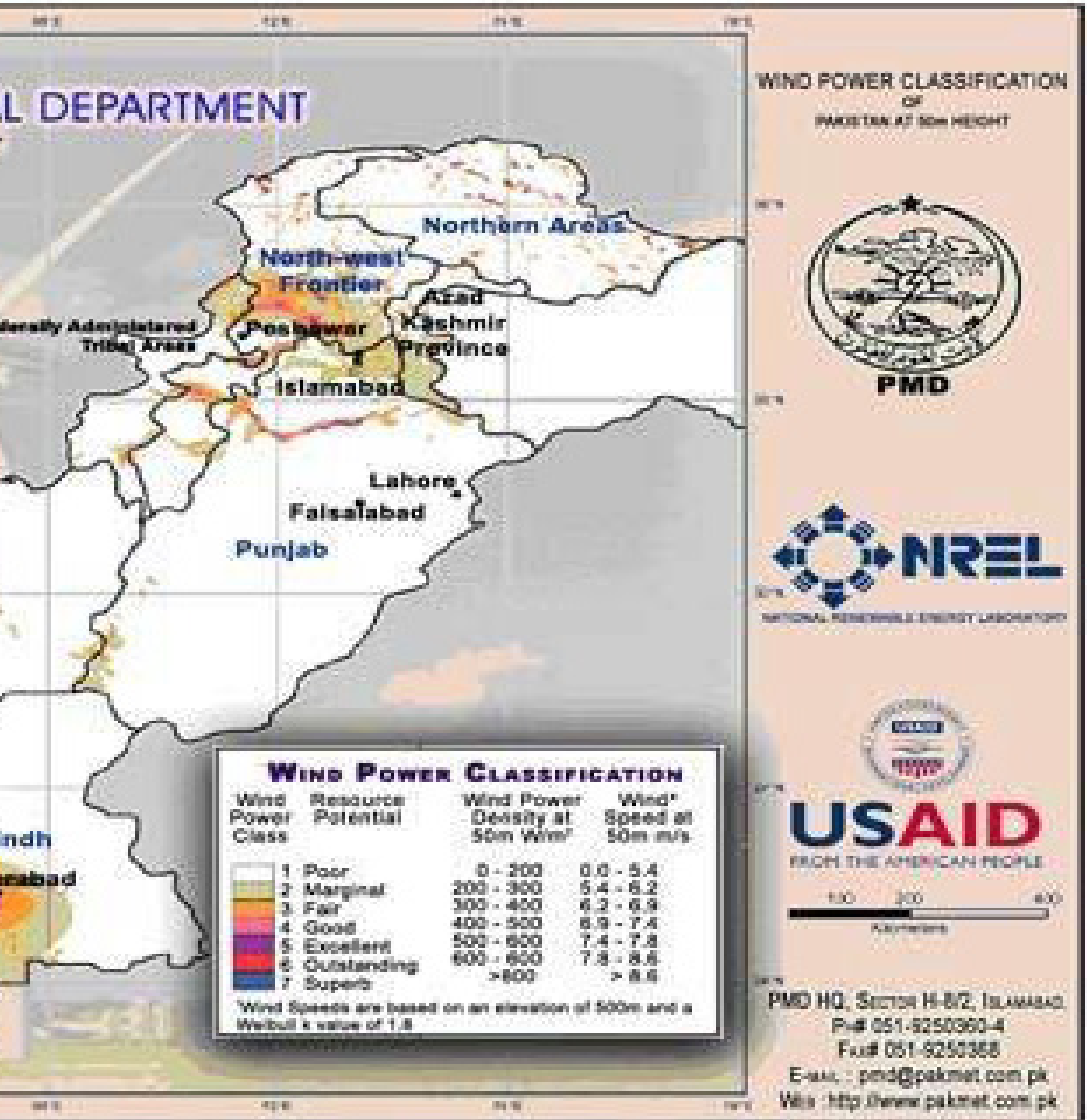
The company is committed to enhance power generation using wind energy and to carry on the business of generating and supply of electric power to the national grid.

The project life cycle of the Metro Wind Farm Project will consist of three stages of project development:

1. Pre-Construction Stage
2. Construction Stage
3. Commissioning Stage



Upon authorization of the Metro Wind-Farm project, the project management team had initiated the planning of the project and hold an informal public consultation with residents and governing figures of Sindh and the



province to address issues and answer any questions. A Project Charter had been drafted and finalized formally identifying project goals, scope, project organization and providing summary of objectives and management.

Site investigations and initiation of a pre-feasibility report and feasibility analysis report had been done in house with the mobilization of surveying, environmental and geotechnical departments.
Project engineers, designers and technologist had prepared preliminary and detailed design specifications and drawings as per reports and site analysis which will be reviewed at 50% and 75% completion to ensure requirements are being met and all quality procedures are being followed by the design team. Contract Documents was tendered for the bidding phase, upon which Contractors (Nordex & Descon) had been selected as EPC contract. A Contract Statement of Work has also been drafted and finalized prompting the construction stage to commence.
The Construction Stage of the Project will start after commencement of project i.e on Commencement Date (CD) which is anticipated on the start of 2015. The mobilization phase will secure permits, bonds, licenses and insurance. A project schedule will be developed for all tasks and a kick-off meeting will be held with stakeholder's and Pattern staff to clarify the scope and ensure a complete understanding of the project's requirements. Equipment and resources will be mobilized to prepare the site for the construction phase,

upon which bi-weekly site inspections will occur for the monitoring and control of quality management, to assure that the work complies with the technical requirements set forth in the contract documents. Procurement of turbines will take place during the construction of roadways, crane pads and turbine foundations. Any civil engineering work including changes to work, shop drawings, record drawings and structural calculations will occur awaiting timely delivery of turbines will be erected upon completion of foundation work and all auxiliary equipment will be installed and connected. A project closing phase will conclude all activities including project "Post-Mortem" Meeting, finalizing all sub- contracts, archiving project documentation, and performing a "Lessons Learned" Report to formally close the project.

The commissioning stage involves activation of the power system and verification that all the equipment and infrastructure that make up the wind farm is in compliance of specifications and code guaranteeing its operability in terms of performance, reliability, safety and information traceability. The site will be cleaned and construction equipment and materials will be taken off site. Access roads will be restored to their original vegetative condition and erosion control will be imple-

-mented. Upon completion of all tests of the power system and auxiliary equipment, a report will be documented stating all requirements have been met and commercial commissioning is approved. The transition of the project to operations will be formalized marking the project's completion. A warranty period will address any warranty issues to the power system and warranty service will be provided for up to 2 years as part of contract.

The Metro Wind-Farm is a fast track project. In order to meet the projected schedule, it is paramount that survey, environmental and geotechnical reports and design reviews are completed within 1 calendar day of receipt. Many tasks will be executed concurrently as per project schedule,

The "Critical Path" is the sequence of activities that determine the project duration. The Metro Wind-Farm Project's critical path is as follows:

1 Initiate project planning
2 Conduct public consultation
3 Finalize "Project Charter"
4 Survey selected sites
5 Conduct environmental assessment
6 Conduct geotechnical assessment
7 Assess the site's wind energy potential

8 Finalize "Feasibility Analysis" Report
9 Obtain land rights
10 Formalize "Power Purchase" agreement
11 Review generator and transmitter specifications
12 Design civil engineering infrastructure
13 Design mechanical and electrical systems
14 Finalize Tender procurement documents
15 Call Tender
16 Open Tender
17 Select contractor
18 Formalize "Contract Statement of Work"
19 Obtain building permits
20 Obtain project liability insurance
21 Conduct Project "Kick-off" Meeting
22 Mobilize equipment
23 Preparation of site
24 Procurement of turbines
24 Prepare construction and maintenance of infrastructure
25 Perform civil engineering work
26 Erect turbines
27 Install and connect electrical equipment
28 Conduct Project "Post-Mortem" Meeting
29 Finalize and close all sub-contracts
30 Archive project documentation

31 Perform and finalize a "Lessons Learned" Report
32 Clean site
33 Approve commercial commissioning
34 Finalize transition
35 Project Completion
36 Provide warranty service

MILESTONES

TASK

1 Finalize "Project Charter"
2 Finalize "Feasibility Analysis" Report
3 Obtain land rights
4 Formalize "Power Purchase" agreement
5 Finalize Tender procurement documents
6 Call Tender
7 Open Tender
8 Select contractor
9 Formalize "Contract Statement of Work"
10 Conduct Project "Kick-off" Meeting
11 Preparation of site
12 Perform civil engineering work
13 Erect turbines
14 Install and connect electrical equipment
15 Conduct Project "Post-Mortem" Meeting
16 Perform and finalize a "Lessons Learned" Report
17 Finalize transition
18 Project Completion

PROJECT CHARTER

Project Title: 50 MW Metro Wind Farm Project
Authorization Date: September 22, 2014
Projected Finish Date: October 30, 2015
Project Team: ENGR. HAMID SIDDIQUI AND V-CON

Project Objectives:

1. Construct Metro Wind Farm in Jhimpir region Sindh by the erecting 20 wind turbines. The wind farm will produce sustainable energy for roughly 75000 homes for a guaranteed 20 years.
2. Lease of 1553 acres of agricultural land (at the cost of $3 million annually)
for locations of the 20 turbines for length of the Metro Wind Farm.
3. Reach a new long term Energy Purchase Agreement with CPPA/NTDC for the duration of the 20 years.

Approach:

1. Pre-Construction Phase
1.1 Pre-Design Phase
1.2 Design Phase
1.3 Bidding Phase
2. Construction
2.1 Mobilization
2.2 Construction

2.3 Project Close-out
3. Commissioning Phase
3.1 System Activation
3.2 Warranty Period

Milestones
Kick-off meeting
Call tender
Open Tender
Select Contractor
Ground breaking ceremony
Construction of all windmills
Project Completion

Budget Information: $490 million (approx. $5.8 million/turbine) which has been gathered through funding from IFC & local banks as well as funding from the Provincial Government. About a tenth of the cost of this project expansion is going towards labor costs.

Project Success Criteria:
*. Successfully completed within timeframe.
*. Budget Requirements met.
*. Provide CPPA/NTDC with an environmentally-sustainable source of energy. This wind-farm will produce enough power to meet the needs of nearly 70,000 homes annually.

Assumptions and Constraints:
*. Leasing vital land requirements from Govt. of Sindh.
*. Funding from IFC & local banks.
*. Expanding long term power purchase agreement

Risks:
*. Delays in construction schedule due to the inability of erecting wind turbines because of wind or weather conditions.
*. Shipment and availability of Nordex wind turbines.

Stakeholder Register:

Internal Stakeholder	Name	Position	Contact information	Sign-off
MPCL	Hamid S.	Project Director	xyz@yahoo.com	
MPCL	Nazim K.	Project Manager	xyz@yahoo.com	
MPCL	Sultan H.	Project Engineer	xyz@yahoo.com	
MPCL	Vilad S.	President	xyz@yahoo.com	
MPCL	Shair A.	Finance Manager	xyz@yahoo.com	

External Stakeholders	Contact Information	Sign-off
Govt. of Sindh	-	
Sindh Wild Life Department	-	
Sindh Environmental Protection Agency	-	
Haji Lakhano Goth	All villagers	
Haji Wallo Goth	All villagers	
Bacho Jhakro Goth	All villagers	

WORK BREAKDOWN STRUCTURE

1.0 Pre-Construction Stage
1.1 Pre-Design Phase
1.1.1 Initiate project planning
1.1.2 Conduct public consultation
1.1.3 Finalize "Project Charter"
1.1.4 Survey selected sites
1.1.5 Conduct environmental assessment
1.1.6 Conduct geotechnical assessment
1.1.7 Assess the site's wind energy potential
1.1.8 Finalize "Feasibility Analysis" Report
1.1.9 Obtain land rights
1.1.10 Formalize "Power Purchase" agreement
1.2 Design Phase
1.2.1 Review foundation requirements
1.2.2 Review specifications and drawings of turbines
1.2.3 Review generator and transmitter specifications
1.2.4 Design civil engineering infrastructure
1.2.5 Design mechanical and electrical systems
1.2.6 Finalize Tender procurement documents
1.3 Bidding Phase
1.3.1 Call tender
1.3.2 Open tender
1.3.3 Select contractor
1.3.4 Formalize "Contract Statement of Work"
2.0 Construction Stage
2.1 Mobilization Phase
2.1.1 Obtain building permits
2.1.2 Develop project schedule

2.1.3 Obtain project liability insurance
2.1.4 Conduct Project “Kick-off” Meeting
2.1.5 Mobilize equipment
2.1.6 Preparation of site
2.2 Construction Phase
2.2.1 Commence bi-weekly site inspections
2.2.2 Procurement of turbines
2.2.3 Prepare construction and maintenance infrastructure
2.2.4 Perform civil engineering work
2.2.5 Erect turbines
2.2.6 Install and connect electrical equipment
2.3 Project Close-out
2.3.1 Conduct Project “Post-Mortem” Meeting
2.3.2 Finalize and close all sub-contracts
2.3.3 Archive project documentation
2.3.4 Perform and finalize a “Lessons Learned” Report
3.0 Commissioning Stage
3.1 System Activation
3.1.1 Perform mechanical tests
3.1.2 Verify electrical and communication systems
3.1.3 Restore condition of access roads and control erosion
3.1.4 Clean site
3.1.5 Approve commercial commissioning
3.1.6 Finalize transition
3.1.7 Project Completion
3.2 Warranty period
3.2.1 Provide warranty service

WORK BREAKDOWN STRUCTURE DICTIONARY

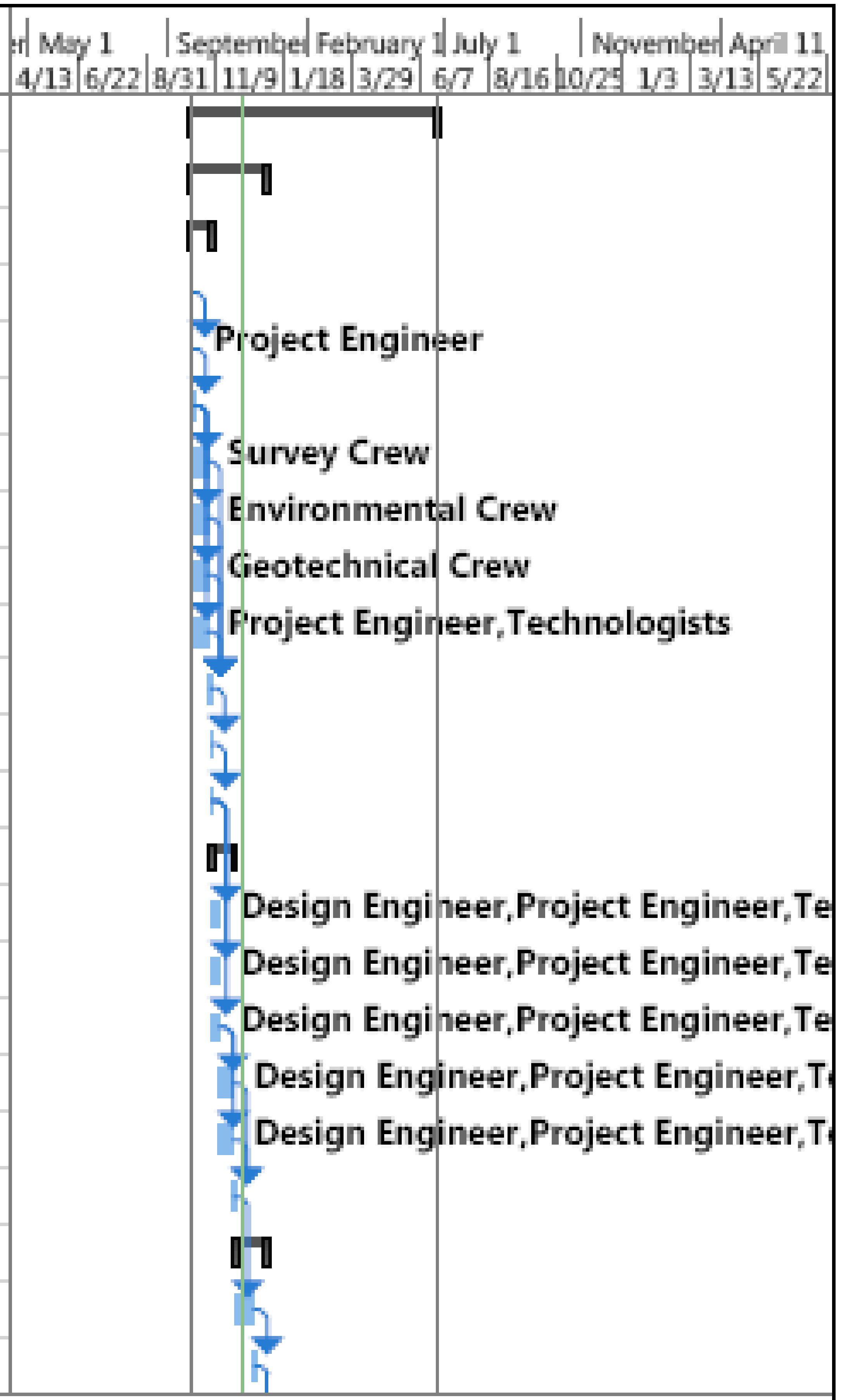
1.1 Pre-Construction Stage: Commence Pre-design, Design and Bidding Phase
1.2 Pre-design Phase: During the pre-design phase, studies are done to analyze space requirement issues, the constraints and opportunities of the proposed site, and the cost versus the budget.
1.2.1 Initiate project planning: Commence planning of project identifying project goals, scope, project organization, stakeholders, business case and constraints
1.2.2 Conduct public consultation: Conduct informal public consultation to seek input on project.
1.2.3 Finalize "Project Charter": Finalize document formally recognizing the existence of project and provides summary of objectives and management.
1.2.4 Survey Selected Sites: Survey ideal sites to establish maps and network scheme for new turbines
1.2.5 Conduct environmental assessment: Assess environmental, social and economic impacts of project.
1.2.6 Conduct geotechnical assessment: Perform soil testing of selected sites to make recommendations for turbine foundations.
1.2.7 Assess the site's wind energy potential: Analyze wind data from different farms.
1.2.8 Finalize "Feasibility Analysis" Report: Complete evaluation and analysis of the project.
1.2.9 Obtain land rights: Finalize land lease agreements.

1.2.10 Formalize Power Purchase agreement: Formalize power purchase agreement.
1.2 Design Phase: Create design that will correctly and completely implement all requirements.
1.2.1 Review foundation requirements: Review foundation requirements as per geotechnical report.
1.2.2 Review specifications and drawings of turbines: Review Nordex's 2.5MW turbine specifications and drawings as per manufacturer manual.
1.2.3 Review generator and transmitter specifications: Review generator and transmitter specifications as per Electrical Engineer's report.
1.2.4 Design civil engineering infrastructure: Design road layout, crane pads, turbine foundations, structural calculations and construction specifications.
1.2.5 Design mechanical and electrical systems: Design collection system and interconnection substation.
1.2.6 Finalize Tender procurement documents: Complete tender and contract documents including all survey and design work needed to prepare quantities a n d guideline costs.
1.3 Bidding Phase: Negotiate and conclude calls for tenders and contracts.
1.3.1 Call Tender: Announce award of public contract through open tender to maximize economy and efficiency in public procurement.
1.3.2 Open Tender: To maintain transparency in the opening of tenders, opening of tenders will occur in presence of bidders.
1.3.3 Select contractor: Choose contractor with highest

score via evaluation modalities.
1.3.4 Formalize "Contract Statement of Work": Sign-off of Contract Statement of Work between parties.
2.1 Construction Stage: Consists of Mobilization, Construction and Project close out phases.
2.2 Mobilization Phase: Secure contractual issues as permits, bonding and insurance and develop project schedule.
2.2.1 Obtain building permits: Submit and get approval for development and building permits.
2.1.2 Develop project schedule: Develop project schedule to monitor and control project activities.
2.1.3 Obtain project liability insurance: Apply and get approval for insurance policies.
2.1.4 Conduct Project "Kick-off" Meeting: Conduct Project Kick-off meeting to improve competencies, team interaction and the overall team environment to enhance project performance.
2.1.5 Mobilize equipment: Mobilize forces and equipment necessary to perform required work.
2.1.6 Preparation of site: Clear vegetation and surface soil.
2.2 Construction Phase: Initiation of construction phase.
2.2.1 Commence bi-weekly site inspection: Commence bi-weekly site inspection for duration of project.
2.2.2 Procurement of turbines: Procurement of Nordex's 2.5 MW turbines
2.2.3 Prepare construction and maintenance infrastructure: Construction of roadways, crane pads

and turbine foundations.
2.2.4 Perform civil engineering work: Perform all civil engineering work including changes to work, shop drawings, record drawings and structural calculations.
2.2.4 Erect turbines: Erect 20 Nordex's 2.5MW turbines.
2.2.5 Install and connect electrical equipment: Connect wind turbine power system to all auxiliary components.
2.3 Project Close-out Phase: Commence all activities to formally conclude project.
2.3.1 Conduct Project "Post-Mortem" Meeting: Conduct Project "Post-Mortem" Meeting to assess the project and reflect on team member, stakeholder and management relationships.
2.3.2 Finalize and close all sub-contracts: Terminate contracts as per completion of work.
2.3.3 Archive project documentation: Archive project documentation for future auditing purposes.
2.3.4 Perform and finalize a "Lessons Learned" Report: Complete Lesson's Learned Report to promote the recurrence of desirable outcomes, preclude the
recurrence of undesirable outcomes and archive best practices.
3.1 Commissioning Stage: Verifying all equipment and infrastructure of wind farm power system and marks the beginning of the project's operation phase.
3.2 System Activation: Commence start-up of power system.
3.2.1 Perform mechanical tests: Perform mechanical tests to ensure compliance with specifications.
3.2.2 Verify electrical and communication systems: Verify electrical and communication systems are in compliance of specifications
3.2.3 Restore condition of access roads and control erosion: Restoration of access roads to their original vegetative condition.
3.2.4 Clean site: Clean site of excess construction materials and waste.
3.2.5 Approve commercial commissioning: Assess entire power system project and give approval for transitioning to operations party.
3.2.6 Finalize transition: Formalize transition of power system to operations party.
3.2.7 Project Completion: Acknowledgement of project completion.
3.3 Warranty period: Address warranty issues.
3.3.1 Provide warranty service: Provide warranty service of power system and auxiliary equipment for up to 90 days

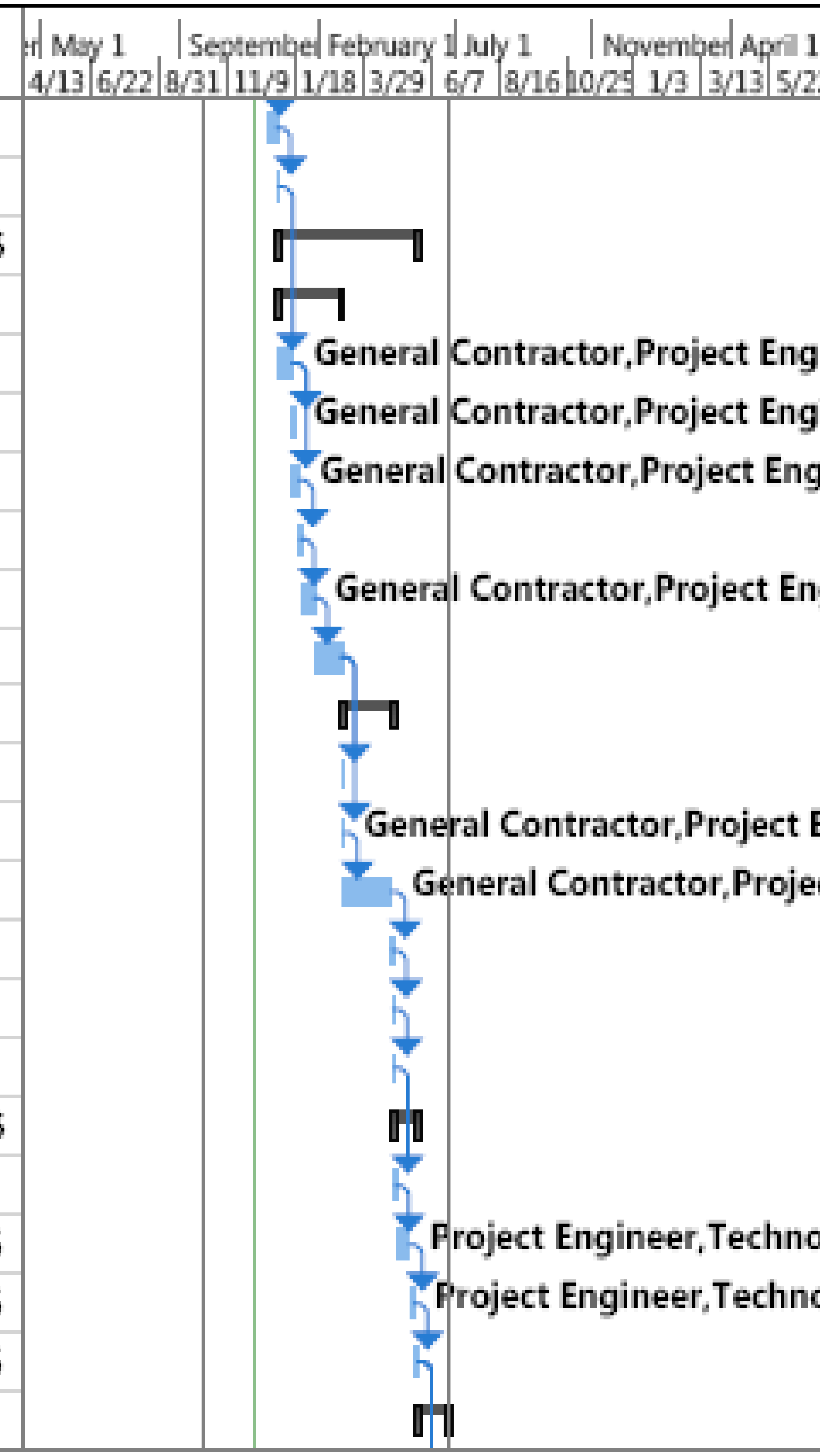
ID	WBS	Task Name	Duration	Start	Finish
1	1	**50MW METRO WIND POWER PROJECT**	182 days	Oct 15 '14	Jun 25 '15
2	1.1	**Pre-ConstructionStage**	57 days	Oct 15 '14	Jan 1 '15
3	1.1.1	**Pre-Design Phase**	17 days	Oct 15 '14	Nov 6 '14
4	1.1.1.1	Initiate Project Planning	1 day	Oct 15 '14	Oct 15 '14
5	1.1.1.2	Conduct Public Consultation	1 day	Oct 16 '14	Oct 16 '14
6	1.1.1.3	Finalize "Project Charter"	1 day	Oct 17 '14	Oct 17 '14
7	1.1.1.4	Survey selected sites	10 days	Oct 20 '14	Oct 31 '14
8	1.1.1.5	Conduct Environment Assessment	10 days	Oct 20 '14	Oct 31 '14
9	1.1.1.6	Conduct Geotechnical Assessment	10 days	Oct 20 '14	Oct 31 '14
10	1.1.1.7	Assess the site's wind energy potential	10 days	Oct 20 '14	Oct 31 '14
11	1.1.1.8	Finalize "Feasibility Analysis" Report	2 days	Nov 3 '14	Nov 4 '14
12	1.1.1.9	Obtain land rights	1 day	Nov 5 '14	Nov 5 '14
13	1.1.1.1C	Formalize "Power Purchase" agreement	1 day	Nov 6 '14	Nov 6 '14
14	1.1.2	**Design Phase**	16 days	Nov 7 '14	Nov 28 '14
15	1.1.2.1	Review foundation requirements	5 days	Nov 7 '14	Nov 13 '14
16	1.1.2.2	Review specifications and drawings of turbines	5 days	Nov 7 '14	Nov 13 '14
17	1.1.2.3	Review generator and transmitter specifications	5 days	Nov 7 '14	Nov 13 '14
18	1.1.2.4	Design civil engineering infrastructure	10 days	Nov 14 '14	Nov 27 '14
19	1.1.2.5	Design mechanical and electrical systems	10 days	Nov 14 '14	Nov 27 '14
20	1.1.2.6	Finalize Tender procurement documents	1 day	Nov 28 '14	Nov 28 '14
21	1.1.3	**Bidding Phase**	24 days	Dec 1 '14	Jan 1 '15
22	1.1.3.1	Call tender	14 days	Dec 1 '14	Dec 18 '14
23	1.1.3.2	Open tender	1 day	Dec 19 '14	Dec 19 '14



Project: Project
Date: Dec 8 '14

Task · Split · Milestone · Summary · Project Summary · Inactive Task · Inactive Milestone · Inactive Summary · Manual Task · Duration-only · Manual Summary Rollup · Manual Summary · Start-only · Finish-only · External Tasks · External Milestone · Deadline · Progress · Manual Progress

ID	WBS	Task Name	Duration	Start	Finish
24	1.1.3.3	Select contractor	7 days	Dec 22 '14	Dec 30 '14
25	1.1.3.4	Formalize "Contract Statement of Work"	2 days	Dec 31 '14	Jan 1 '15
26	**1.2**	**Construction Stage**	**102 days**	**Jan 2 '15**	**May 25 '15**
27	**1.2.1**	**Mobilization Phase**	**46 days**	**Jan 2 '15**	**Mar 6 '15**
28	1.2.1.1	Obtain building permits	10 days	Jan 2 '15	Jan 15 '15
29	1.2.1.2	Develop project schedule	1 day	Jan 16 '15	Jan 16 '15
30	1.2.1.3	Obtain project liability insurance	5 days	Jan 16 '15	Jan 22 '15
31	1.2.1.4	Conduct Project "Kick-off" Meeting	1 day	Jan 23 '15	Jan 23 '15
32	1.2.1.5	Mobilize equipment	10 days	Jan 26 '15	Feb 6 '15
33	1.2.1.6	Preparation of site	20 days	Feb 9 '15	Mar 6 '15
34	**1.2.2**	**Construction Phase**	**39 days**	**Mar 9 '15**	**Apr 30 '15**
35	1.2.2.1	Commence bi-weekly site inspections	1 day	Mar 9 '15	Mar 9 '15
36	1.2.2.2	Procurement of turbines	1 day	Mar 9 '15	Mar 9 '15
37	1.2.2.3	Prepare construction and maintenance infrastructure	35 days	Mar 10 '15	Apr 27 '15
38	1.2.2.4	Perform civil engineering work	1 day	Apr 28 '15	Apr 28 '15
39	1.2.2.5	Erect turbines	1 day	Apr 29 '15	Apr 29 '15
40	1.2.2.6	Install and connect electrical equipment	1 day	Apr 30 '15	Apr 30 '15
41	**1.2.3**	**Project Close-out**	**17 days**	**May 1 '15**	**May 25 '15**
42	1.2.3.1	Conduct Project "Post-Mortem" Meeting	1 day	May 1 '15	May 1 '15
43	1.2.3.2	Finalize and close all sub-contracts	10 days	May 4 '15	May 15 '15
44	1.2.3.3	Archive project documentation	3 days	May 18 '15	May 20 '15
45	1.2.3.4	Perform and finalize a "Lessons Learned" Report	3 days	May 21 '15	May 25 '15
46	**1.3**	**Commissioning Stage**	**23 days**	**May 26 '15**	**Jun 25 '15**



Project: Project
Date: Dec 8 '14

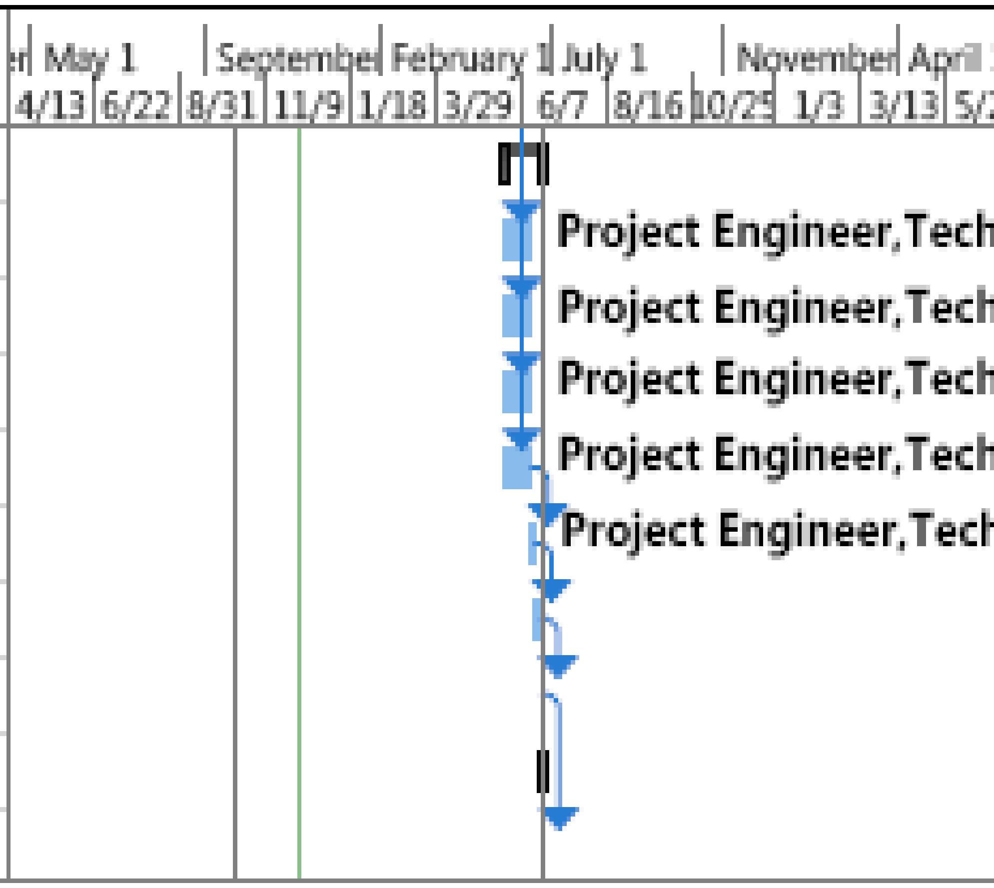
Task	Inactive Summary	External Tasks
Split	Manual Task	External Milestone
Milestone	Duration-only	Deadline
Summary	Manual Summary Rollup	Progress
Project Summary	Manual Summary	Manual Progress
Inactive Task	Start-only	
Inactive Milestone	Finish-only	

ID	WBS	Task Name	Dura
47	**1.3.1**	**System Activation**	**22 d**
48	1.3.1.1	Perform mechanical tests	15 d
49	1.3.1.2	Verify electrical and communication systems	15 d
50	1.3.1.3	Restore condition of access roads and control erosion	15 d
51	1.3.1.4	Clean site	15 d
52	1.3.1.5	Approve commercial commissioning	3 da
53	1.3.1.6	Finalize transition	3 da
54	1.3.1.7	Project Completion	1 da
55	**1.3.2**	**Warranty period**	**1 da**
56	1.3.2.1	Provide warranty service	1 da

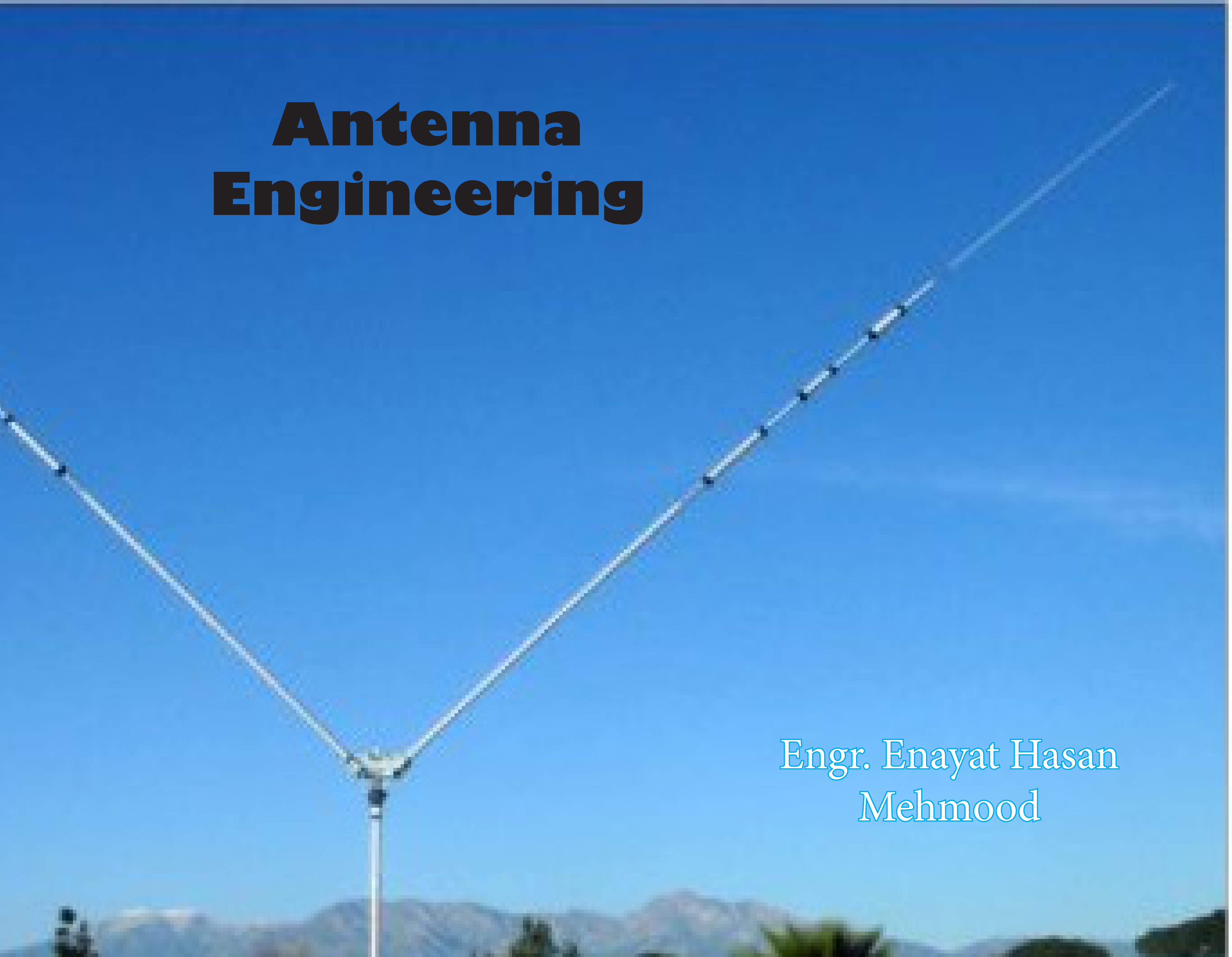
Project: Project
Date: Dec 8 '14

Task	Inactive Summa
Split	Manual Task
Milestone	Duration-only
Summary	Manual Summa
Project Summary	Manual Summa
Inactive Task	Start-only
Inactive Milestone	Finish-only

tion	Start	Finish
ays	**May 26 '15**	**Jun 24 '15**
ays	May 26 '15	Jun 15 '15
ays	May 26 '15	Jun 15 '15
ays	May 26 '15	Jun 15 '15
ays	May 26 '15	Jun 15 '15
ys	Jun 16 '15	Jun 18 '15
ys	Jun 19 '15	Jun 23 '15
y	Jun 24 '15	Jun 24 '15
y	**Jun 25 '15**	**Jun 25 '15**
y	Jun 25 '15	Jun 25 '15



ry
External Tasks
External Milestone
Deadline
ry Rollup
Progress
ry
Manual Progress



Antenna Engineering

Engr. Enayat Hasan Mehmood

The prototype of this antenna was the antenna proposed by UW4HW (Radio, No. 12/1968), and a variant of this antenna UA6HKH (Radio No. 9/1 1981). My version of this antenna works from 3.5 to 28 MHz.

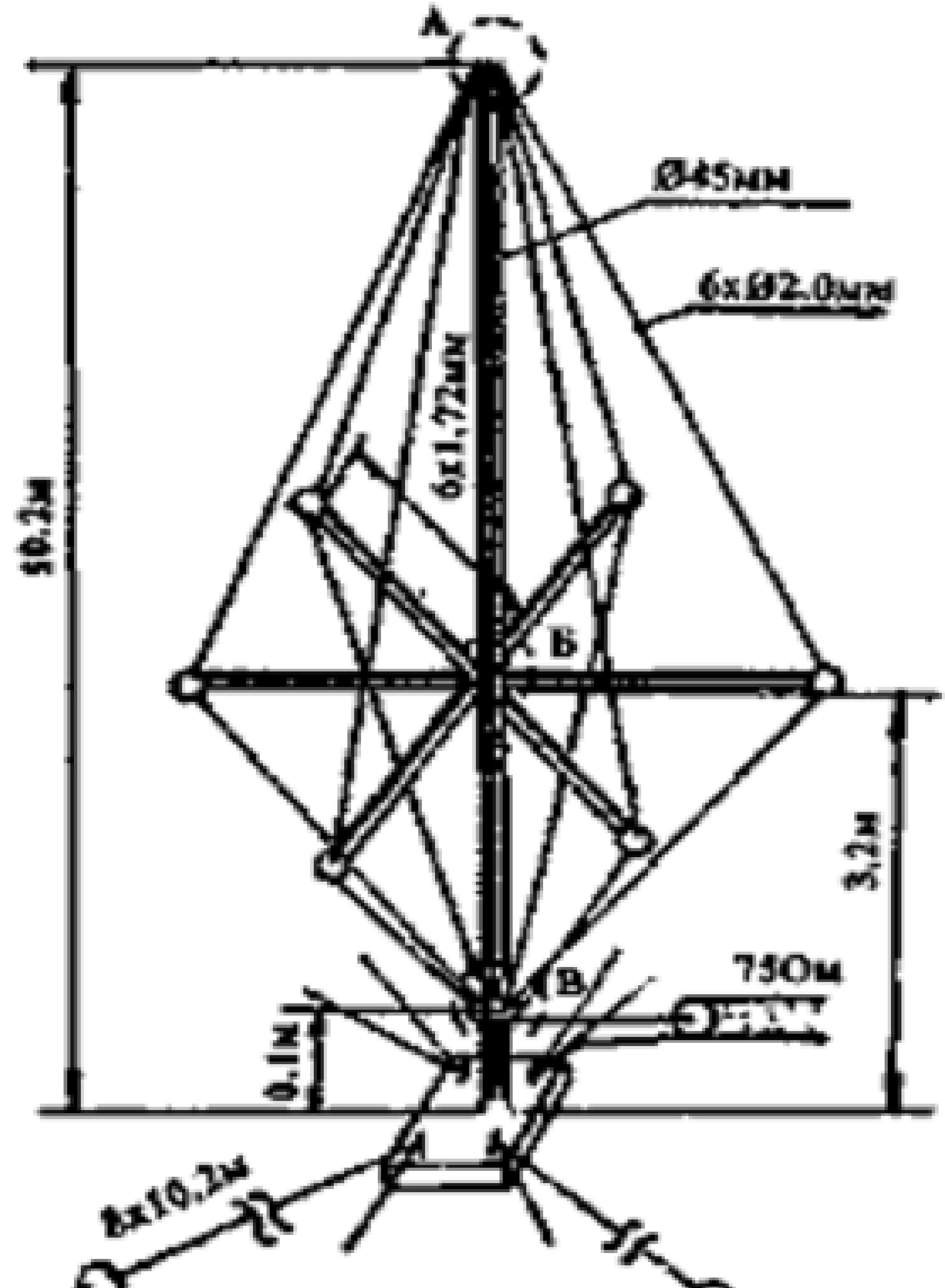


Figure 1a

The antenna worked perfectly at 3.5 MHz and not bad at 1.8 MHz! Then I redid my GP at 7 MHz into such an antenna, but with a height of 10.2 m (see Figure 1). The antenna has been operating since 1986. There have been hundreds of DX QSOs on various bands. At 3.5 MHz, JA gives 569 with an output power of 120 W. On all other bands, almost all DX I hear are answered. With an output power of 0.5 W, there is a QSO with the NM7G at 14 MHz, which rated my signals at 449. The CWS over the ranges: 3.5 MHz - 1.2; 7 MHz - 1.2; 10 MHz - 1.2; 14 MHz - 1.1; 21 MHz - 1.3; 28 MHz-1.2.

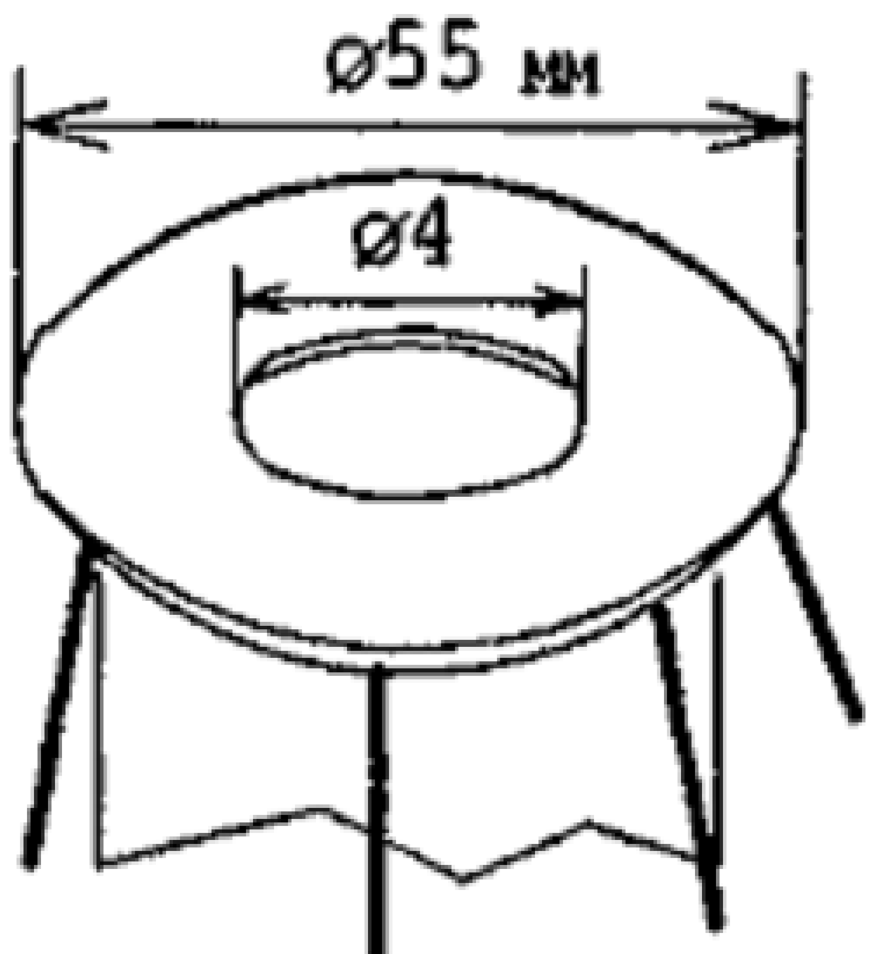
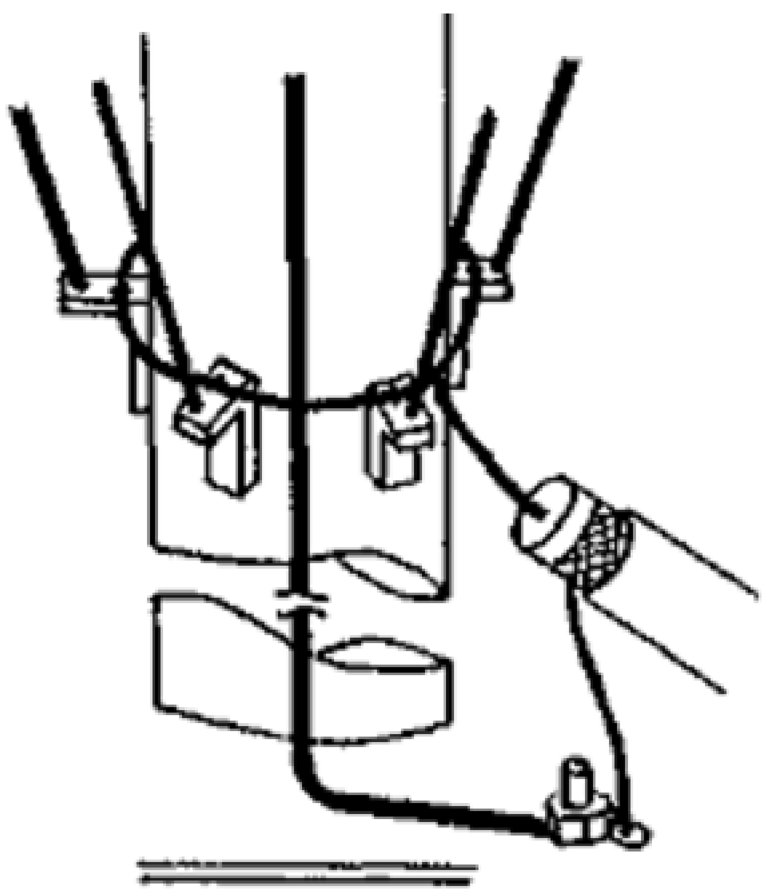


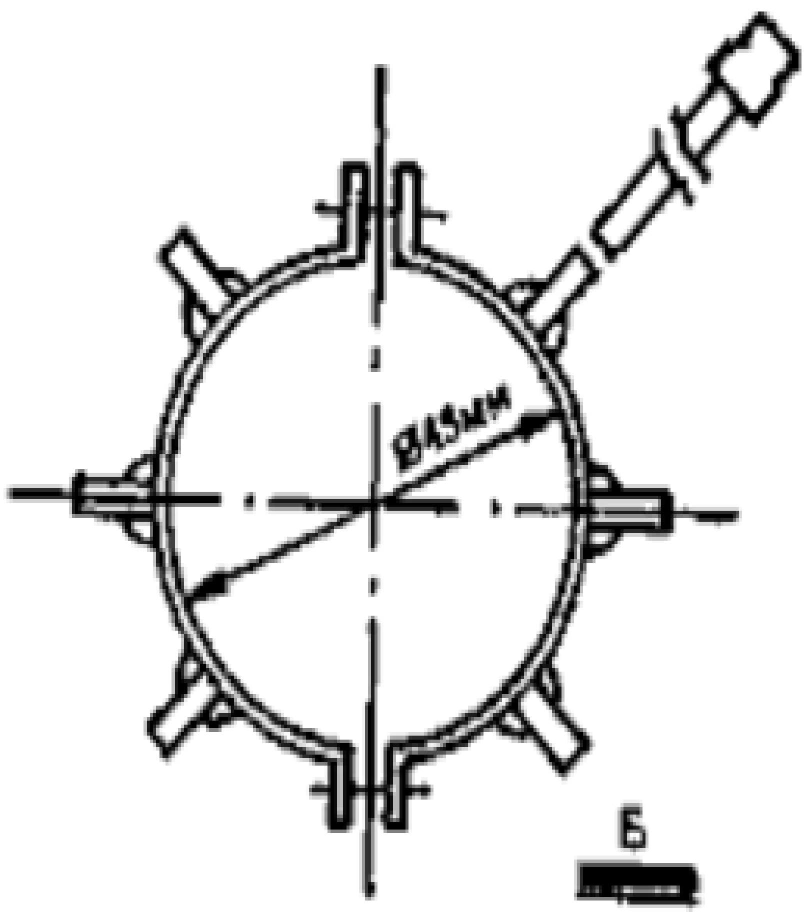
figure 1

The antenna is stretched by two tiers of delays. Horizontal struts are made of metal tubes with an internal diameter of 10 mm, which are mounted on bolts with a diameter of 10 mm, welded heads to the brackets (position B). Roller insulators are attached to the other ends of the tubes, to which wires are attached. In the upper part of the mast reinforced insert, equal to the internal diameter of the mast with a central hole under the MCh. The washer is screwed from double-sided fiberglass 1.5 - 2 mm thick (position A). Both foil side washers must be soldered. The ends of the wires are inserted into the seven holes of the washer and soldered to it. The washer is screwed with an M4 screw.



Thus, on the top of the mast is obtained and the mechanical and electrical contact wires of the antenna. The seventh wire is needed to eliminate the bad contacts in the mast joint and goes along the mast, it is connected to the counterweights and the cable braid. At the bottom of the antenna, 6 wires are threaded into the holes of the L-shaped insulators (position B) and are interconnected as a ring. These insulators are taped to the mast. A cable core is soldered to this ring. Braid cable - to counterweights, which are connected in pairs to the four bolts on the metal heel of the antenna, located on a flat roof.

Thus, all the connections of the working part of the antenna are soldered and not subject to climatic influences, which is very important! If you also connect four counterweight with a length of 20.4 m, the antenna will work better at 3.5 MHz. ■

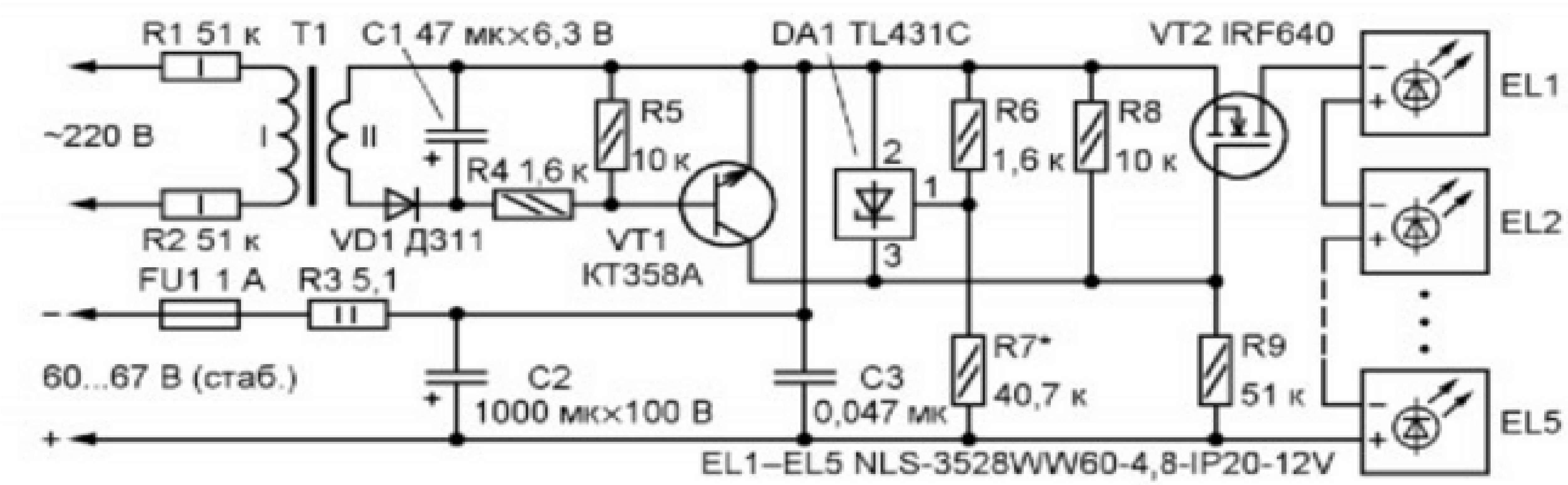


LED Emergency light



Engr. Kader Abdullah

There are many designs of lamps using super-bright LEDs. Often, their number is measured in dozens, which requires fairly large labor costs for the manufacture of circuit boards and the installation of LEDs on them. However, this can be avoided by applying the so-called LED strip in the luminaire. It consists of parallel-connected 12-volt (less commonly 18-or 24-volt) cells, each of which contains three (four, six) LEDs connected in series in a housing for surface mounting and a current-limiting resistor.
On one meter of such a tape is placed from 60 to 240 LEDs. The manufacturer of the LED strip has already done the painstaking work of mounting them; you just have to cut a fragment of the necessary length from it and solder two leads.
By selecting the number of cells in the fragments and using their serial and parallel connections, it is possible to fabricate a luminaire with the required lighting characteristics and optimal values of voltage and current for the existing power source.



As an example of the use of LED tape, the figure shows a diagram of a device designed for night and emergency lighting of a large (about 400 m2) warehouse, darkness in which is unacceptable, as surveillance cameras are installed in it.

The EL1-EL5 luminaires, each of which is a segment of NLS-3528WW60-4,8-IP20-12V LED strip of 10 cells (30 LEDs), are located around the perimeter of the room. They are powered from a stabilized source with a voltage of 60 ... 67 V with a backup battery and are turned on automatically when an unexpected electric light is turned off, as well as at the end of the working day, when the light goes out in the warehouse. Surveillance cameras are able to increase their sensitivity, and the specified number of LEDs is quite enough for them to work in standby mode.

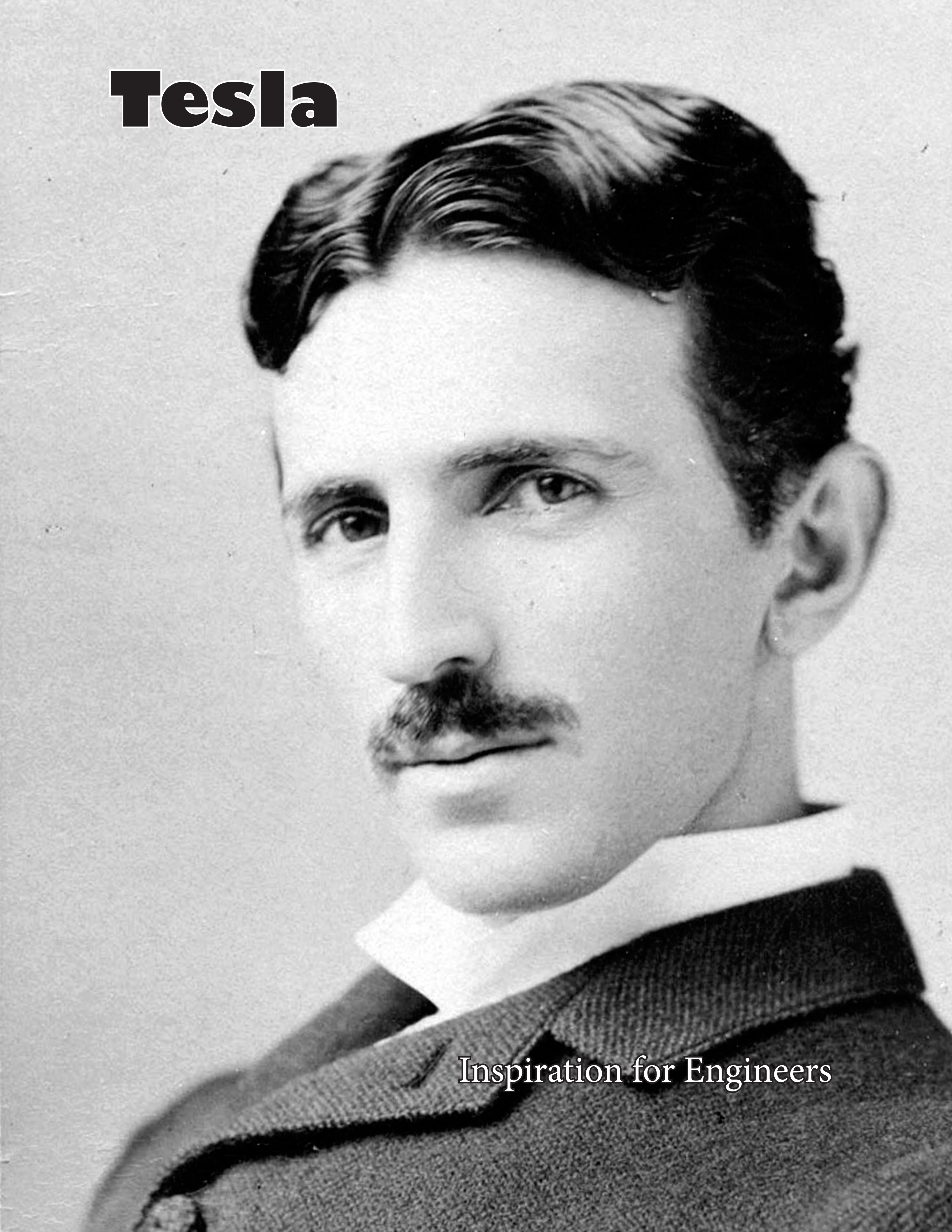
The device, which provides automatic switching on and off of the lamp, is made on transistors VT1 and VT2. Through resistors R1, R2 and step-down transformer T1 it is connected to the nearest lamp of conventional electric lighting. In the presence of the mains voltage on it, the transistor VT1 is opened by a rectified diode VD1 with the voltage of the secondary winding of the transformer T1 and shunts the gate-source circuit of a powerful field-effect transistor VT2, so it is closed and the lamps EL1-EL5 are de-energized. The loss of voltage on the luminaire of standard lighting leads

to the fact that the transistor VT1 closes and VT2 opens, closing the power supply circuit of the LED lamps from the backup source. The parallel stabilizer DA1 protects the luminaires from overvoltage and impulse noise. The protection tripping voltage (within 70.72 V) is set by selecting the resistor R7.

The device is assembled on a breadboard. Resistors - MLT, C2-33 and the like, capacitors C1, C2 - imported oxide, C3 - ceramic KM-5 with a nominal voltage of 100 V. I used a step-down transformer (T1) with a transformer ratio around the galvanic isolation of the device 30 from subscriber loudspeaker. You can use other transformers, picking up resistors R1 and R2 so that the alternating voltage on the secondary winding when the standard lighting is turned on is about 1 V.

To adjust the protection, instead of the LED luminaires, a conventional 40-watt incandescent lamp is temporarily connected, and the resistor R7 is replaced with a switched-on rheostat with a variable or trimming resistor with a resistance of 47.68 kΩ. Setting its engine to the position corresponding to the maximum resistance, and controlling the output voltage with a digital voltmeter, changing the resistance of the resistor, achieving a sharp disappearance of the output voltage when the input voltage increases to 70.72 V. After that, the resistor is evaporated, measure the resistance between the terminals of the resistive element and replace it with the same resistance . To facilitate the selection, you can make R7 of two resistors connected in series or in parallel. ■

Tesla



Inspiration for Engineers

Tesla was left-handed as a boy, but later became ambidextrous. Left-handedness was a definite handicap in the freehand-drawing studies, but he could have done much better work than he actually produced and would have gotten higher marks if it were not for a piece of altruism in which he engaged. A student whom he could excel in drawing was striving hard for a scholarship. Were he to receive the lowest marks in freehand drawing, he would be unable to obtain the scholarship. Tesla sought to help his fellow student by intentionally getting the lowest rating in the small class.Mathematics was his favorite subject and he distinguished himself in that study. His teachers, at first, had some doubts about his honesty, thinking he had worked out some clever deceit for getting the right answers. In due time their skepticism was dispelled and they accepted him as a student who was unusually apt at mental arithmetic.There were many books in his father's library. The knowledge in those books interested him more than that which he received in school and he wished to spend his evenings reading them.Nature seemed to be constantly engaged in staging spectacular demonstrations for young Tesla, revealing to him samples of the secret of her mighty forces.Tesla even as a boy was an original thinker and he never hesitated to think thoughts on a grand scale, always carrying everything to its largest ultimate dimension as a means of exploring the cosmos.Tesla, as a boy, knew no limits to the universe of his thinking; and as a result he built an intellectual realm suficiently large to provide ample space in which his more mature mind could operate without encountering retarding barriers.at the age of fourteen. He had distinguished himself as a scholar. In one grade, however, his mathematics professor gave him less than a passing mark for his year's work. Tesla felt an injustice had been done him, so he went to the director of the school and demanded that he be given the strictest kind of examination in the subject. This was done in the presence of the director and the professor, and Tesla passed it with an almost perfect mark. The project with which he amused himself was drawn upon an even larger scale and required a still higher order of imagination. He conceived the project of building a ring around the earth at the Equator, somewhat resembling the rings around the planet Saturn. The

earth ring, however, was to be a solid structure whereas Saturn's rings are made up of dust particles. Tesla loved to work with mathematics, and this project gave him an excellent opportunity to use all of the mathematical techniques available to him.TESLA entered manhood with a definite knowledge that nameless forces were shaping for him an unrevealed destiny. Tesla in 1875, at
the age of 19, went to Graumltz, in Austria, to study electrical engineering at the Polytechnic Institute. He intended henceforth to devote all his energies to mastering that strange, almost occult force, electricity, and to harness it for human welfare.His first effort to put this philosophy to a practical test almost resulted in disaster despite the fact that it worked successfully. Tesla completely eliminated recreation and plunged into his studies with such enthusiastic devotion
that he allowed himself only four hours' rest, not all of which he spent in slumber.His power of
visualization--the ability to see as solid objects before him the things that he conceived in his mind, and which he had considered such a great annoyance in childhood--now proved to be of great aid to him in trying to unravel this problem. He made an elastic rebound from the intellectual
trouncing administered by his Professor and was tackling the problem in methodical fashion.Instead of going to the University of Prague in the fall of 1878 as he had planned, Tesla accepted a lucrative position that was offered him in a technical establishment at Maribor, near Graumltz. He gained practical experience in the early 1880s working in telephony and at Continental Edison in the new electric power industry. He emigrated to the United States in 1884, where he would become a naturalized citizen. He worked for a short time at the Edison Machine Works in New York City before he struck out on his own. With the help of partners to finance and market his ideas, Tesla set up laboratories and companies in New York to develop a range of electrical and mechanical devices. His alternating current (AC) induction motor and related polyphase AC patents, licensed by Westinghouse Electric in 1888, earned him a considerable amount of money and became the cornerstone of the polyphase system which that company would eventually market. Tesla won numerous medals and awards over this time. They include:

Order of St. Sava, II Class, Government of Serbia (1892)
Elliott Cresson Medal (1894)
Order of Prince Danilo I (1895)
AIEE Edison Medal (1917)
Order of St. Sava, I Class, Government of Yugoslavia (1926)
Order of the Yugoslav Crown (1931)
John Scott Medal (1934)
Order of the White Eagle, I Class, Government of Yugoslavia (1936)
Order of the White Lion, I Class, Government of Czechoslovakia (1937)
University of Paris Medal (1937)
The Medal of the University St. Clement of Ochrida, Sofia, Bulgaria (1939) ■

Voices of the Engineers



A lot of recruitment agencies are taking money illegally from applicants, some time this amount is around 3 lac Pakistani rupees, Dehalvi recruitment agency charged 1 and a half lac rupees from one of our colleague and sold him the work visa, although in interview, client offered him position, after 1 week of interview, recruiter called him and asked for money for job and visa, also warned him if he will not pay, his application will be cancel.

(Engr. Athaullah memon,karachi)

The job market is down due to a lot of visit visa job hunters, we are facing severe job cuts, and low average raises, most of these job hunters are even ready to work for 20 to 25% of minimum wages, it is better if recruitment will be processed, by only legal recruitment agencies.

(Engr. Mohammad ali rajwana)

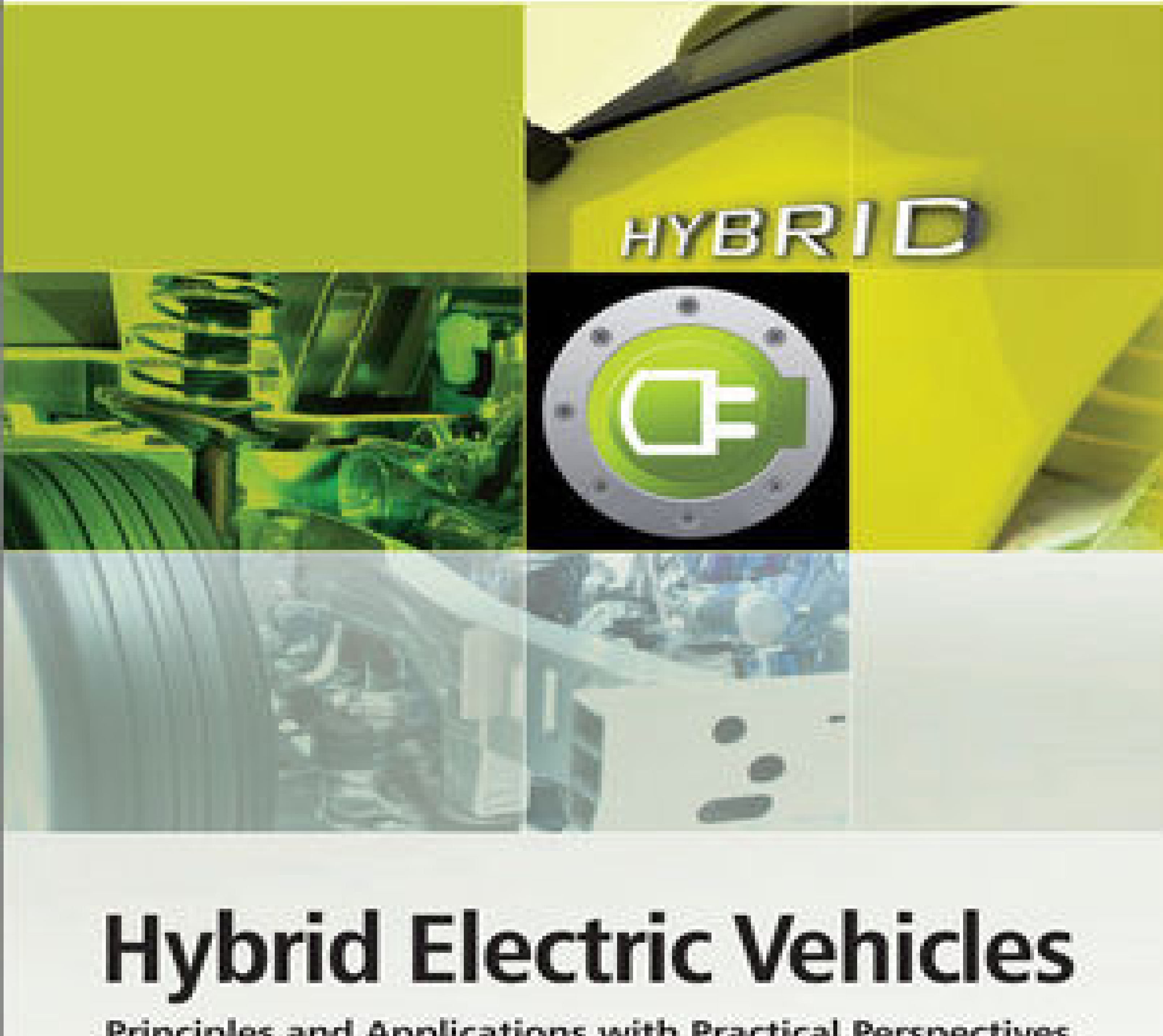
office politics is normal day to day activity, non technical managers are just busy to utilize engineering minds in nonproductive jobs, and present there performance as secondary in front of higher management.

(Engr. Abdul Aziz khan)

BOOK OF THE MONTH

Modern Hybrid Electric Vehicles provides vital guidance to help a new generation of engineers master the principles of and further advance hybrid vehicle technology. The authors address purely electric, hybrid electric, plug-in hybrid electric, hybrid hydraulic, fuel cell, and off-road hybrid vehicle systems. They focus on the power and propulsion systems for these vehicles, including issues related to power and energy management. They concentrate on material that is not readily available in another hybrid electric vehicle (HEV) books such as design examples for hybrid vehicles and cover new developments in the field including electronic CVT, plug-in hybrid, and new power converters and controls.
Covers hybrid vs. pure electric, HEV system architecture (including plug-in and hydraulic), off-road and other industrial utility vehicles, non-ground-vehicle applications like ships, locomotives, aircraft, system reliability, EMC, storage technologies, vehicular power and energy management, diagnostics and prognostics, and electromechanical vibration issues.
Contains core fundamentals and principles of modern hybrid vehicles at the component level and system level.
Provides graduate students and field engineers with a text suitable for classroom teaching or self-study.

Chris Mi, M. Abul Masrur and David Wenzhong Gao

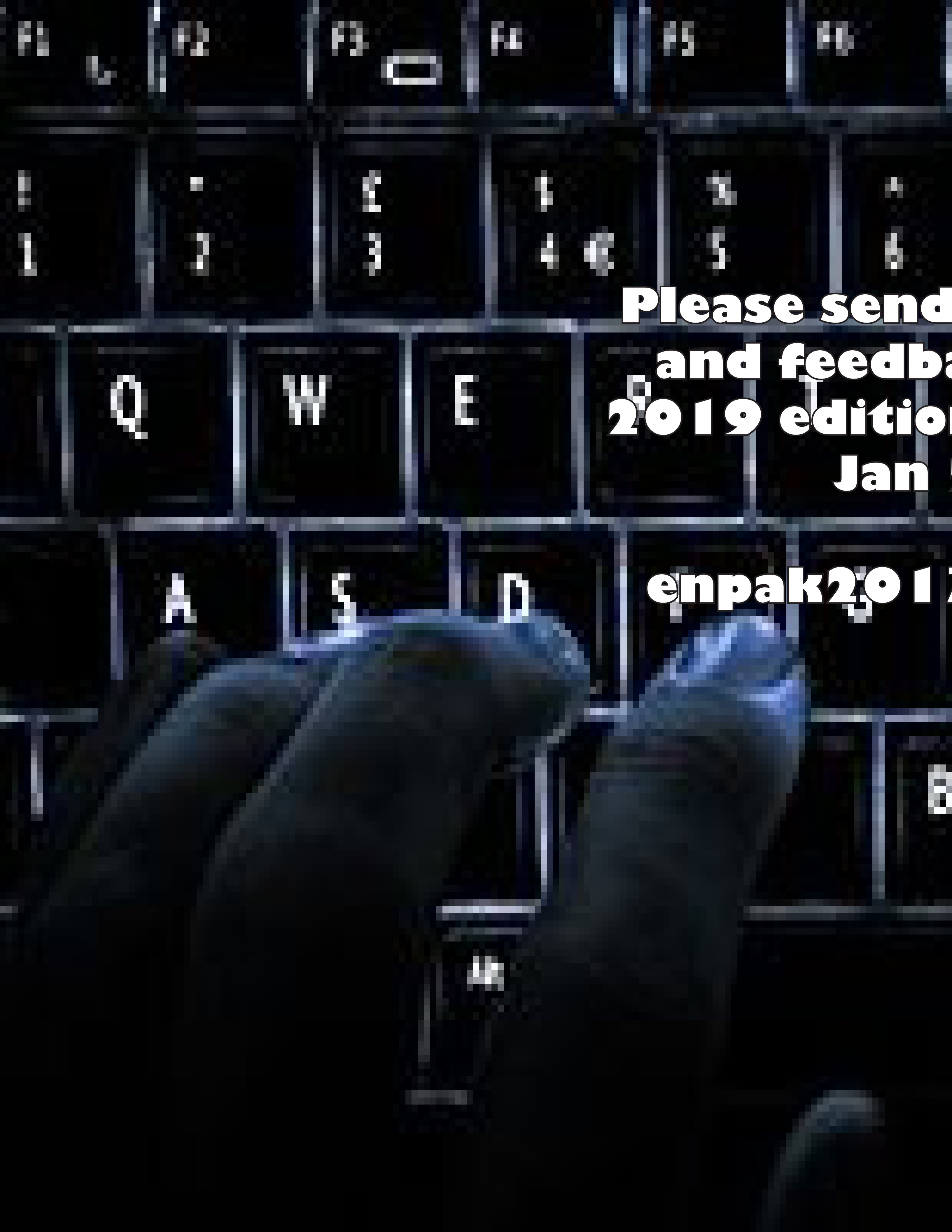


Hybrid Electric Vehicles

Principles and Applications with Practical Perspectives

WILEY




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